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Educational technology tools used by extension professionals: a North Central Region survey

Eusebio Dagoberto Torres Quintana
Iowa State University

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Torres Quintana, Eusebio Dagoberto, Ph.D.

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U·M·I
300 N. Zeeb Rd.
Ann Arbor, MI 48106

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Eusebio Dagoberto Torres Quintana

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CHAPTER I. INTRODUCTION

When I listen, I forget; when I see, I remember; and when I do, I learn. --Chinese proverb

Communication is an important aspect of human beings' relationships since 70% of one's day is spent in oral communication with someone else (Driscoll, 1988). Enhancing good communication is a matter that receives much attention in education. At Iowa State University, improving communication skills within agriculture courses is a primary concern of agricultural professors (Gamon, 1988).

The invention of the Gutenberg press has increased and improved the communication process. Today, people are able to share their ideas in writing as well as verbally. The rapidly developing field of technologies related to educational program delivery has the potential to deliver information instantaneously thereby overcoming such barriers as distance, time, and cost. The increasing capabilities and decreasing cost of these technologies have been the panacea of providing accurate information, managing increasing volumes of data, and completing routine and tedious tasks quickly, repeatedly, and without error.

However, several barriers still exist which inhibit the communication process both inside and outside the classroom. According to Wittich, Walter, and Schuller (1962, p. 2, cited in Hansen, 1971), the barriers to communication existing in the classroom are: 1) verbalism, 2) referent confusion, 3) daydreaming, 4) imperception, 5) disinterest, and 6) physical discomfort.

Good communication is the keystone in education. An educator who is an effective communicator is "someone who understands people and can get a message across that helps them learn" (Patterson, 1991, p. 31).

Technological advances in education, called educational technologies, have provided educators with innovative and valuable teaching tools. Many of these tools are especially useful in reducing the barriers to communication found in the classroom. More specifically, educational technologies are those pieces of hardware and equipment and related software to support program delivery and management. Examples range from the traditional overhead projector and computers to emerging technologies such as the satellite uplink/downlink.

Agricultural education has two major components--formal classroom education and nonformal Extension education (Macias, 1990). The former is characterized as a schooling function. It provides students with the skills and knowledge required for future use. The latter is often used to satisfy the immediate learning needs of its clientele. Both are oriented towards problem solving. Both share the common characteristics of a structured program with defined learning objectives (Blackburn, 1989). Also, both frequently use educational technologies as a delivery method.

According to Cole (1981, cited in Creswell, 1989), Extension studies have shown that the use of teaching methods are an effective device to bring about desired behavioral changes. Extension research has also shown that using a variety of teaching methods produces desired behavioral changes (Creswell, 1990).

Extension agriculturists recognize the importance of utilizing a variety of teaching methods and instructional tools to carry out their programs; however, the lack of training is a barrier that hinders their use (Creswell, 1990).

Educational technology tools (ETt) are now feasible for use in the Extension teaching-learning process. They may have the potential to overcome some of the barriers of communication in education since they may attract the attention of the learner.

ETt are very versatile teaching tools designed to satisfy learners' preferences on how they want or need to learn. For example, a picture, a graph, a computer image, or a computer spreadsheet program may be more expressive than a lecture.

ETt used for educational purposes have improved student achievement. They complement the teaching-learning process since students have the opportunity to confirm and apply their knowledge. ETt are a complement, but not a substitute, for educators and books. Multimedia environments, no matter how rich and complex, cannot replace good teachers (Wilson, 1991).

The Office of Technology Assessment (1990) states that the new technological devices such as computers, interactive video, satellite, and other media linking teachers and students through distant learning are designed to improve learning and retention in formal and Extension education.

In summary, ETt should be the instrument to open up learning experiences for achieving the educational goals of adults (Gerver, 1987).

Statement of the Problem

Rasmussen (1989, p. 4), commenting on the Cooperative Extension System's mission statement, states: "The Cooperative Extension System helps people improve their lives through an educational process which uses scientific knowledge focused on issues and needs."

The Electronic Technology Task Force (1985, p. 5) reported that the work tasks and activities performed by Extension personnel should be divided into these three functional areas:

1. Information delivery (to flow research information from the land grant universities, the state agriculture experimental stations, and the USDA through the Cooperative Extension Service to its clientele).
2. Educational programs delivery. It is prepared "...to upgrade the knowledge, skills, and capabilities of clientele.
3. Problem-solving tasks (to solve immediate farm and family problems).

Many individuals pursue additional education through the Extension Service. To satisfy this demand, Extension personnel must be aware of their clients' characteristics and needs, processes of educational development, and delivery methods. Also, they must be aware of the educational tools that exist that will enable them to better perform their jobs and use their resources more efficiently.

Adults comprise a large portion of Extension's clientele. Adults have their own autonomy of direction in learning and their own individualistic personal experiences. This combination challenges the

process of teaching. Creswell (1990) points out that learning does not take place just because the adults are in a classroom. Also, adults have to deal with other barriers such as limited time to take classes, location and travel time, and the cost of education (Cross, 1981). Patterson (1991) summarizes by stating that an understanding of the learning process is a key element for the Extension staff to satisfy their clientele needs.

Paoni (1983, cited in Saban, 1989) describes that the average instructor dedicates the majority of his/her classroom time (80-90%) in the use of teaching strategies. The rest of the classroom time (10-20%) is dedicated to instructional activities.

The lecture-discussion method is the most common teaching strategy employed by Extension professionals in Iowa (Martin & Omer, 1988).

For these reasons it is important that Extension professionals become aware of the various educational technology tools (ETt), identify the appropriate use of these tools, and attempt to reduce or remove the obstacles that impede their effective use. In the end, the effectiveness of the Cooperative Extension Service's mission should be improved.

Need for the Study

The teaching methods used by Extension have been studied extensively and several recommendations have been made. Hildreth and Armbrusters (cited in Creswell, 1989) pointed out that Extension Service must improve its program delivery methods in order to survive. Kelling (1989) reported that the Extension Service is a later adopter of information technology.

The National Agricultural Research and Extension Users Advisory Board, in its March 1980 report to the President and Congress, recommended that Extension personnel improve their teaching methods and technology transfer systems with a better use of the most current technology (cited in Creswell, 1989). Later on, the Electronic Technology Task Force (1985, p. vii), in its May 1985 report, recommended that "the CES must embrace the philosophy that the adoption of emerging electronic technology will enhance its program delivery capability."

Purpose and Objectives

Improvement of programs relevant to client needs is a vital part of maintaining quality Extension programs. As the use of technology becomes more widespread, it is important that Extension professionals become aware of its strengths and weaknesses.

This research project focuses on the use of educational technology tools (ETt) within the Extension Service and its professional staff including administrators, state and area specialists, and county-based staff in the 12-state North Central Region of the United States. ETt are those pieces of equipment, software, and hardware used by Extension staff members to support program delivery and management.

The research was undertaken for the purpose of investigating the kinds of ETt available, assessing the current and future use of these technologies, and identifying barriers that prevent their use in Extension programs. More specifically, the objectives for this study were:

1. To identify the current inventory of the following educational technology tools (ETt) available to Extension personnel:

   a. Audio-cassette player
   b. Carousel slide projector
   c. Overhead computer projector
   d. Overhead projector
   e. Movie projector
   f. Microcomputers
   g. Microcomputer modem
   h. Interactive videodisk
   i. CD-ROM
   j. Satellite downlink
   k. Video camcorder (VCR) camera
   l. Video camcorder (VCR) player/recorder.

2. To determine the opinion of Extension personnel regarding their knowledge and actual/potential use of ETt to enhance their programs.

3. To identify and quantify which of the following barriers inhibit the greater use of educational technology tools (ETt) in Extension:

   a. Lack of funds
   b. Lack of experience
   c. Conflict with other job responsibilities
   d. Lack of time
   e. Unaware of the technology
   f. No interest in the equipment
   g. Lack of administrative support
   h. Lack of training.

4. To determine the relationships between selected demographic variables and the barriers which may inhibit the use of ETt.

5. To assess the extent of the current and future use of the following educational materials and software:

   a. Spreadsheets
   b. Word processing
   c. Data base management
   d. Telecommunications

e. Presentation graphics
f. Tutorial programs
g. Drill/practice programs
h. Simulation programs
i. Decision aid programs
j. Expert systems
k. Videotapes
l. Information/data base services.

6. To measure the current use and anticipated use of ETt in three functional areas of Extension (administration and planning, group instruction, and individual instruction) for the following groupings as ETt:

   a. Traditional--carousel slide projector, overhead projector, movie projector, audiocassette player
   b. Computer--microcomputer, mini-computer, modem, CD, overhead projection units
   c. Video--VCR player, VCR camera, VCR recorder/player
   d. Emerging--satellite uplink/downlink, microwave communication, fiber-optics land-line, FM side-band, interactive videodisk.

7. To determine the relationships between selected demographic variables and the current and future use of ETt.

Hypotheses

In order to achieve these objectives, the following null hypotheses were identified.

Hypothesis 1: For all Extension professionals in the North Central Region, there are no significant differences in the barriers which may have prevented them from utilizing ETt when grouped by: a) traditional, b) computer, c) video, d) satellite uplink/downlink, e) microwave transmission, f) fiber-optics, and g) interactive videodisk.

$$HO1: \mu_a = \mu_b = \ldots = \mu_g.$$

Hypothesis 2: For all Extension professionals in each state in the North Central Region, there are no significant differences in the barriers which may have prevented them from utilizing ETt when grouped by: a) traditional, b) computer, c) video, d) satellite uplink/downlink, e) microwave transmission, f) fiber-optics, and g) interactive videodisk.

HO2: $\mu_1 = \mu_2 = \ldots = \mu_{12}$.

Hypothesis 3: There is no relationship between the barriers which may have prevented Extension personnel from utilizing different classes of educational technology equipment and the following demographic variables:

a. Extension personnel's age
b. Extension personnel's sex
c. Extension personnel's present position
d. Extension personnel's major
e. Extension personnel's education (highest degree held)
f. Extension personnel's years of experience
g. Extension personnel's number of group presentations per year
h. Extension personnel's number of inservices attended (2 and 3-5 years).

Hypothesis 4: There is no significant difference in the extent to which Extension personnel currently use and anticipate using the following types of educational materials and software: a) traditional programs, b) teaching aids, and c) other forms.

HO4: $\mu_{\text{currently use}} = \mu_{\text{anticipate using}}$.

Hypothesis 5: Extension personnel among different states of the North Central Region have similar perceptions related to the extent of the current use and anticipated use of the following types of educational

materials and software: a) traditional programs, b) teaching aids, and c) other forms.

HO5: $\mu_1 = \mu_2 = \ldots = \mu_{12}$ Current use.

HO5: $\mu_1 = \mu_2 = \ldots = \mu_{12}$ Future use.

Hypothesis 6: There is no relationship in the extent to which Extension personnel currently use and anticipate using the different types of educational materials and the following demographic variables:

a. Extension personnel's age
b. Extension personnel's sex
c. Extension personnel's present position
d. Extension personnel's major
e. Extension personnel's education (highest degree held)
f. Extension personnel's years of experience
g. Extension personnel's number of group presentations per year
h. Extension personnel's number of inservices attended (2 and 3-5 years).

Hypothesis 7: There is no significant difference in the extent to which Extension personnel at each state currently use and anticipate using the following educational technology equipment: a) traditional, b) computers, c) video, and d) emerging technologies.

HO7: $\mu_{1 \text{ currently use}} = \mu_{1 \text{ anticipate using}}$.

Hypothesis 8: There is no significant difference in the current and anticipated use of educational technology equipment in administration and planning, group instruction, and individual instruction programs as perceived by Extension personnel.

HO8: $\mu_{\text{currently use}} = \mu_{\text{anticipate using}}$.

Hypothesis 9: There is no relationship between the extent to which Extension personnel currently use and anticipate using educational technology equipment and the following demographic variables:

a. Extension personnel's age
b. Extension personnel's sex
c. Extension personnel's present position
d. Extension personnel's major
e. Extension personnel's education (highest degree held)
f. Extension personnel's years of experience
g. Extension personnel's number of group presentations per year
h. Extension personnel's number of inservices attended (2 and 3-5 years).

Assumptions

The following assumptions are made in this study:

1. The respondents participated voluntarily.
2. The answers of the questionnaire reflect the actual experience and opinion of the participants.
3. The participants in the study clearly understood the statements, questions, and definitions provided in the instrument.
4. There is a need for Extension personnel to be aware of possible new educational technologies.
5. There is a need for the adoption of different educational technologies, such that more of those served by Extension have access to educational materials through the use of these technologies.

Delimitations

The limitations of the study are identified as follows:

1. The research project was limited to the North Central Region which included these states: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.
2. Educational materials and software were limited to the following classes: spreadsheets, word processing, data base management, telecommunications, presentation graphics, tutorial programs, drill/practice programs, simulation programs, decision aid programs, expert systems, videotapes, and information/data base services.
3. The educational technology tools were limited to the following classes: traditional, computers, video, and emerging as defined above.
4. The study was limited to those randomly selected Extension personnel who were willing to participate in the study.
5. The study was limited to closed-ended questions.
6. The results should not be used to evaluate individuals and the delivery systems used by those involved in the study.
7. The results should not be used to force adoption of methods presently not used by Extension personnel.
8. The results of the study should not be used to rate the effectiveness of Extension personnel.

9. The results of the study should not be used to evaluate the effectiveness of Extension programs.

Glossary

Carousel: A general term for an automatic slide projector with circular gravity-fed magazine (Ellington & Harris, 1986).

CES: Acronym for Cooperative Extension Service or System.

Clientele: Refers to individuals or groups who participate in Extension programs.

Compact Disk (CD): An ultra high-fidelity audiodisk on which the audio signal is recorded in digital form. Such disks are only 12 cm in diameter and are played in a similar way to an optical videodisk, using a laser to read the signal (Ellington & Harris, 1986).

Compact Disk-Read Only Memory (CD-ROM): A computing term for a store from which information can be read as often as required, but once entered, cannot normally be changed (Ellington & Harris, 1986).

Computer: Any device, usually electronic, which is able to accept data, apply some processing procedure to it, and supply the resulting new data in a form suitable to the user (Ellington & Harris, 1986).

Fiber-optics: A system which uses long, very thin glass fibers which have the ability to transmit light signals with very little distortion and attenuation.

FM side-band: Frequency channels created for educational broadcasting (Saettler, 1990).

Hardware: A term used for the physical parts of the computer which are involved in the production, storage, distribution, and reception of electronic signals (Ellington & Harris, 1986).

Interactive video: A hybrid individualized learning system in which a random-access videotape recorder or videodisk player is linked to a digital computer through a special interfacing system that enables television material stored on videotape or videodisk to be incorporated into computer-based learning program(s) administered via the computer (Ellington & Harris, 1986).

Microcomputer: A small computer system built around a microprocessor that performs most of the functions of a mainframe computer, but at slower speeds, handling smaller data sets and usually servicing only one user at a time (Lockard, Abrams, & Many, 1987).

Microwave: Line of sight, point-to-point transmission of signals at high frequency.

Microwave link: A telecommunication link that involves beaming signals encoded on microwaves (electromagnetic waves in the frequency range 10^9-10^{12} Hz) between aerials connected by line-of-sight (Ellington & Harris, 1986).

Modem: A computer input/output device that is used to convert a digital signal into an analog signal capable of being transmitted along an ordinary telephone line or to reconvert an analog signal back into digital form after such transmission (Ellington & Harris, 1986).

Overhead projector: A device designed to project easily-visible images from large transparencies onto an external screen in an undarkened room (Ellington & Harris, 1986).

Package: A computing term for a generalized program or set of programs designed to meet the needs of several users or to fulfill a specific user-oriented function. Also known as a software package (Ellington & Harris, 1986).

Satellite dishes (downlink): Electronic device (a dish-shaped antenna) which picks up the signal transmitted from communication satellites, refocuses it, and boots it again.

Satellite uplink: Electronic device capable of sending video, audio, and/or data signals 23,000 miles into space to one of several fixed-orbit communications satellites. The satellite boots the signal and sends it back to earth in a "sprayed" pattern (Stinehart et al., 1987).

Software: A computed routine program that indicates to the computer what to do and how to do it. It is the information that makes the computer operate and perform various functions (Erickson, Hinton, & Szoke, 1985).

Data base management: A software to organize, store, and access data of related files.

Decision aid program: A computerized package used to solve a certain situation.

Drill and practice program: A package that helps learners remember and use information they have previously been taught. The

students are asked to make simple responses, fill in the blanks, choose among a restricted set of alternatives, or supply a missing word or phrase (Saettler, 1990).

Expert System: A computer system programmed to ask users to supply information on a problem. The computer then processes the information and reaches conclusions at or near the level of human expert (Hussain & Hussain, 1986).

Information/data base services: An entity that provides to its users current information and/or data bases, usually for a fee, for a variety of uses.

Presentation graphics: A software proficient to transform data into pictures or graphic outputs for presentation purposes.

Simulation program: Electronic environment that provides students the opportunity to manipulate variables. It has its own set of rules, and the way a learner plays his or her role determines the outcome of the simulation (Saettler, 1990).

Spreadsheet: A software program that arranges rows and columns for stored data.

Tutorial programs: Computer programs that teach by carrying on a dialogue with the learner. These programs are characterized by a strong degree of author control rather than learner control (Saettler, 1990).

Word processing: A computer program for writing, editing, revising, formatting, and printing text (Lockard et al., 1987).

Telecommunications: The process of linking computers via phone lines for the fast and efficient exchange of information (Lockard et al., 1987).

Video Cassette Recorder (VCR): A videorecorder that uses videocassettes as its storage medium (Ellington & Harris, 1986).

Video: A term applied to all visual aspects of television signals, equipment, etc., as in video signal, video amplifier (Ellington & Harris, 1986).

Videotape: Special magnetic tape on which video signals or television signals are (or can be) recorded (Ellington & Harris, 1986).

CHAPTER II. REVIEW OF LITERATURE

The purpose of this chapter is to present a summary of the literature related to educational technology tools (ETt). The review of literature is organized around the following sections: Cooperative Extension Service (CES), learning theories and their relationship to CES, and educational technology tools (ETt) as a teaching method.

Cooperative Extension Service (CES)

Give a man a fish, you feed him for a day.
Teach a man to fish, you feed him for life.

This epigram by Kuan-Tzu, a Chinese philosopher, underlines the Cooperative Extension System's mission statement dealing with educational activities. The CES seeks to educate people on how to solve problems by applying and using information and knowledge. As noted by Loftis and Kendal (1991), the primary mission of the CES is to make available unbiased and research-based information to its clientele (individuals and groups who participate in its programs) for informed decision making.

The CES was established by the Smith-Lever Act in 1914 as the third major function of the land grant college system. The responsibility, control, and funding is shared through a three-way partnership among federal, state, and local governments. Its purpose was extending guidance in agriculture and home economics to the people (Blackburn, 1989). After almost eight decades of service, the CES continues to help people learn and apply knowledge to cope with their problems. There are many

definitions of Extension education; however, one of the most complete definitions is stated by Leagans (1961, cited in Blackburn, 1984, p. 1):

> The process of extension education is one of working with people, not for them; of helping people become self-reliant, not dependent on others; of making people the central actors in the drama, not stage hands or spectators; in short, helping people by means of education to put useful knowledge to work for them.

In this definition, Leagans emphasizes Extension as a two-way communication process between the client and the source. Therefore, Extension involves a process in which a person transmits information and another receives and applies the information received (Blackburn, 1984).

Extension programs are people-oriented. The activities of CES focus on agricultural production, agri-businesses, families, non-agricultural businesses, youth, and communities both in the rural and urban environment.

Because agriculture is a vital industry in the United States, much of Extension's resources are allocated to improve and maintain agriculture production practices used by farmers. Extension plays a key role in the dissemination process linking the research results with the people. There is a general consensus that agricultural research and Extension have played a major role in increasing the productivity of agriculture (Brown, 1981).

Extension is a catalyst of rural economic development. Rasmussen (1989) pointed out that Extension has been educating its clientele on the

production of new crops and alternative agriculture activities. Oriental vegetables is an example for California and ginseng production for North Carolina. Mississippi and Arkansas are the core of commercial fish production where pond-raised catfish are supplied for the national market. Wisconsin cheese, Vermont maple syrup, Georgia pecans, and Florida grapefruit are examples of farmers' cooperatives which were organized by Extension.

Extension also effectively serves other clientele including youth and families in rural and urban areas. Rasmussen (1989) indicated that in relation to nutrition, diet, and health, particularly in rural and suburban areas, Extension has played an important role. Extension home economists have helped in the organization and coordination of health fairs and educational activities such as nutritional education. 4-H programs in urban areas in gardening, clothing, landscaping, and home grounds improvement are examples of services provided by Extension to youth. Rasmussen (1989) concluded that Extension programs emphasize different areas. However, the areas of greatest concern by the Cooperative Extension Service are:

1. the agricultural system,
2. natural and environment resources,
3. community and small business development,
4. home economics and family living,
5. 4-H and youth education and development, and
6. international concerns.

Research has shown that Extension is a late adopter of teaching methods (Electronic Technology Task Force, 1985). Currently, mass media, group meetings, and individual contacts are the most common teaching methods used by Extension. Lams and Marion (1991) reported that TV, radio, and newspapers were the best sources of information for facts on energy conservation. Financial and health management required pamphlets, correspondence courses, and recorded telephone messages.

The use of educational technology provides Extension personnel with versatile equipment to satisfy the demands of education. Slide projectors and overhead projectors were the most frequently used teaching tools in Iowa (Creswell, 1990).

Agnew (1991), in a survey of 50 state Extension directors, found that most states planned to increase the use of electronic communication and instructional devices in the next five years. Those educational technologies most likely to increase were: telecommunications as a mode of delivery, hardware to access electronic data sources, interactive instructional video, and computers.

Learning Theories

Learning is a continuous process for human beings which takes place every day in every setting. Learning affects people of all ages and occurs naturally as an individual grows and matures. Each individual is limited to some degree in the amount of learning that he/she can acquire. A person's learning potential and the social and economic environment determine the intrinsic set of characteristics that makes each person

unique. Since each person learns differently, his/her personal situation and characteristics may influence how he/she learns (Bergevin, 1967).

Philip Hosford (1973, p. 35) summarized the many definitions of learning:

> Learning has been defined as a change in the neurological system; a change in behavior; or as a process, a product, a function, and a reorganization.

Learning results in a change--attitude, knowledge, and people's style of life.

A review of various learning theories is appropriate in consideration of using educational technology tools as part of the learning-teaching process.

To describe learning theories, it is necessary to first define a theory. Borg and Gall (1989, p. 25), in Educational Research defined a theory as follows:

> ...a system for explaining a set of phenomena by specifying constructs and the law that relates these constraints to each other.

In this definition, the authors note that constructs are concepts used in research that delineate incidents with common elements.

Theories make important contribution to all sciences. There are several important theories related to educational technology. Briefly, the system theory and communication theory are important in relation to the environment of education technologies. On the other hand, behaviorism and cognitive theory provides the psychological guidance to educational

technology (Thompson, Simonson, & Hargrave, 1990). Each of these is more fully described in the following section.

Systems theory

Instructional system theory is a new philosophy in education which has been applied in industrial and military settings (Saettler, 1990). This theory states that the parts of phenomena should be identified and their impact measured. Saettler (1990) points out that these parts called subsystems operate as a functional process. It is, given a whole closed system such as the earth, any incident in one part of the globe influencing the environment of the others. Systems theory deals with the systematization of an entire organism where behavior is influenced by the organism in its environment (Thompson et al., 1990).

The practical use of this theory in education involves a rational procedure used by instructional planners to design a single lesson or course into an entire curriculum.

A system is an interrelation of different subsystems where each one has a specific function to perform. The environment of the school, the society, and the resources available to learners are the boundaries of the education system. The input to the system is the knowledge delivered to them by educational technological devices and the output is the learner's performance. All the interrelated parts work together to accomplish the learning-teaching goals.

Communication theory

This theory attempts to explain all the elements influencing communication. Communication theory examines the processes of perception whereby stimuli are transmitted to and received by the brain, and the recognition-perception of these stimuli become familiar. Communication is the process of message delivery (Thompson et al., 1990).

Communication theory strives to explain the process of information delivery, that is, how to improve the verbal and nonverbal link among individuals, or how to send a message and receive it back.

In education, the communication theory affects teachers and students through the various communication techniques used to facilitate the learning process.

The innovation-diffusion model is one of the most important applications of mass communication and research in Extension. Rogers and Shoemaker's model describes four different phases in regard to the individual adoption process: knowledge, persuasion, decision, and confirmation. Educational technological devices is the mechanism used for the diffusion of innovations (Saettler, 1990). Communication strategies such as educational technology may bring about a sequence of three distinct changes: cognitive--modify or add previous information; affective--alter people's attitude, belief, or opinion about one issue; and behavior change, which is the end of the process (Lionberger & Gwin, 1982).

Behavior theory

Behaviorists are interested in the observation of behavior, namely stimuli and responses. Behaviorists focus on the relationship established between the response and the reinforcement, which is the theory key concept (Dubin & Okun, 1973).

The behavior theory provides the base for the use of educational technologies, according to Thompson et al. (1990). Thompson et al. (1990) further state:

> ...behaviorists expect any effective instructional activity, such as a computer-based tutorial, to change the student in some obvious and measurable way. After completing a lesson, students should be able to do something that they could not do, or could not do as well, before the lesson.

The behavioral sciences concept of educational technology believes that the learning-teaching process should depend more on educational programmed instruction, individualized approaches to instruction, and computer-assisted instruction.

The behaviorist orientation of educational technology tends to be focused to a curriculum designed in small units which may identify and measure learning products (Saettler, 1990). According to Skinner (cited in Saettler, 1990, p. 14), "a student is taught in the sense that he is induced to engage in new forms of behavior in specific forms upon specific occasions. Teaching is simply the arrangement of contingencies of reinforcement."

Cognitive theory

Cognitive theorists assert that the learner owns autonomy and initiative. This theory attempts to explain the process of how information is received, organized, retained, and used by the brain (Thompson et al., 1990). Cognitive theorists are concentrated on the learning process itself. They assume that a student's existing state of mental organization is the key factor for teaching.

Bruner (1961, cited in Dubin & Okun, 1973) proposed that categorization is the way individuals recognize objectives avoiding the necessity of constant learning. New learning is placed on top of the previous one making possible the reduction of the complexity of the environment. People interacting with the world use categories. These are formed and used in a process like perception, decision making, and conceptualization.

The Collins-Stevens instructional theory is an example of the cognitive theory. The core of this particular theory is integrated for a set of teachers' goals, a number of strategies for achieving the goals, and criteria for selection among the different strategies each time (Saettler, 1990).

Thompson et al. (1990, p. 26) express the differences between behaviorist and cognitive theorists in the following way:

> In a teaching situation, the behaviorist wants to take the learner and produce the desired behaviors by controlling the learning environment. Manipulating the learner and learning situation to produce the desired outcome would be the most

important to the behaviorist. The cognitive theorist would want to study the brain and its functioning to see how learning occurs. This information then can be used to produce learning in students.

According to Saettler (1990), the cognitive theory emphasizes the active role of the learner rather than a passive recipient of environmental stimulation. Educational technology, therefore, is focused on the use of learners' knowledge and constructions to understand the subject matter that is taught. SCHOLAR program is an example of the use of this theory in education with human-tutoring characteristics. It is a tutorial system for teaching facts about South America geography.

Thompson concluded that in spite of the fact that behaviorists and cognitive theorists support the use of educational technology, neither one has suggested the superiority of any particular piece of equipment or software.

Educational Technology Tools (ETt) as a Teaching Method

Like many biological processes, educational systems have changed greatly in the last 50 years. A key factor in this change has been the new dimensions changing technology. Educational technology has been considered as an innovator that has brought about change to education (Saettler, 1990). New technological devices have expanded education. Natural barriers to cultural exchange between people can be overcome. Technical obstacles to the flow of information can be removed to a large

extent (Schramm, 1968). Also, technology can satisfy diverse learning needs because of the tremendous diversity in delivering material in many different formats (Niemi & Gooler, 1987).

Education technology (ET) is defined by the Association for Educational Communication and Technology (AECT) (1977, p. 1) as:

> ...a complex, integrated process involving people, procedures, ideas, devices, and organization for analyzing problems and devising, implementing, evaluating, and managing solutions to those problems involved in all aspects of human learning.

Thompson et al. (1990, p. 4) state that educational technology focuses "on a process that uses devices." They wrote that educational technology is not synonymous with educational computing. Educational computing is considered a part of educational technology.

Reza (1988) outlined six basic benefits of educational technology. They are:

1. improving education in terms of quality and quantity,
2. becoming the teaching-learning process in an individual procedure,
3. developing teaching on a scientific base,
4. using powerful procedures to reach desired outcomes,
5. improving the learning process and making it easier, and
6. linking sources of information and knowledge and people at different ages.

The versatility of educational technology has provided educators with innovative equipment for use in instruction. The equipment helps instructors expand their teaching methods that lead to satisfying the learner needs.

According to Anderson and Kelly (cited in Saban, 1989), there are five major classifications of equipment used as educational technology. They are:

1. print technology,
2. telecommunications or two-way communications,
3. motion picture and video technology (a combination of visual, motion, animation, and audio components),
4. computer technology, and
5. biological manipulation ("the most frightening of all, links all the other technologies to modify human behavior").

For the Extension Service, Waldrom (cited in Blackburn, 1984) concluded that educational technology used in the Extension Service can be divided into two groups: instructional aids and resource-based or packaged course applications. Instructional aids are auxiliary materials that help to enrich a lecture. They may be subdivided into non-mechanical items (blackboards, flip charts, models, and printed text) or mechanical (overhead, slide and film projectors, tape recorders, VCR, playback units, etc.).

Resource-based or packaged course applications are the face-to-face educational tools which do not depend upon the physical presence of the instructor. Examples are correspondence, audiocassette, and media.

As previously cited by Anderson and Kelly, there are five major classifications of equipment used as educational technologies. The next sections of this literature review will summarize the effectiveness of these educational technology tools. Clark and Surgrue (1988) report that no one educational technology tool is superior to all others. However, the combination of them can improve the teaching-learning process.

Print and video educational technology

The evidence supports that traditional technologies such as the carousel slide projector or audiocassette player are familiar standard educational tools which are not very expensive. On the other hand, emerging technologies such as satellite uplink/downlink or microwave transmission are very expensive tools. There has been very little research on their use in education.

As pointed out by Lionberger and Gwin (1982), printed materials are effective communication tools which have two characteristics: 1) storage for a repeated referral, and 2) ease of delivery. On the other hand, they are limited to the awareness and interest stages in the change process. Also, the one-way nature of print media is an obstacle for Extension professionals to pursue their clientele about Extension's programs. Two-way communication is a key factor in dealing with change of attitudes. Other technological devices such as slide/tapes or audiocassettes stimulate dialogue. Slides are useful in identifying who is talking and establishing a relationship between a topic and the discussion of it in

the tape. According to Rasmussen (1989), videotapes are a valuable tool for demonstrations of complex techniques.

Since NASA launched the first satellite (the ATS-1) in 1966, technology opened the possibility to experimental communication in education. Today satellite broadcasting is an important technological device in getting educational programs to rural folks (Rasmussen, 1989).

Satellite-delivery education is a solution to the lack of education where there is no teacher currently available. It allows a broadcasting and distribution system to be set up quickly, providing interaction between students and teachers (Watters, 1991).

Computers as an educational technology

In this section, the computer as an educational technology will be reviewed. There are a multitude of studies on the use of computers in education.

Today, the computer is a very common technological device used to enhance the access to education information. Computers can be used in conjunction with other technologies such as a phone or laser videodisk player without regard to distance.

Although a recent invention, computers have been embraced by education. Their impact on educational technology has been more important than any other recent technological innovation (Strange, 1981). According to the literature, over the last decade the number of microcomputers in schools has increased nearly fifty-fold from about 50,000 to roughly 2,400,000 (Thompson et al., 1990).

Becker (1990) developed a study of the extent of the use of computers. He suggested that:

> Only a small minority of teachers and students can be said to yet be major computer users--that is, where a large portion of instruction, learning, or productive work in their classes is being accomplished through the use of computers (p. 10).

He found that teacher attitude and lack of teacher education on computer use are the primary obstacles to an extended use of computers.

The Center for Technology in Education (CTE) in its 1991 national survey of teachers reported an increase in the use of computers. The study reveals that the average number of computers is the following: 1) elementary schools, 39; 2) middle schools, 53; and 3) high schools, 83. These numbers are higher than the previous ones reported in a random sampling of schools with 19, 26, and 45 computers, respectively (CTE, cited in Brady, 1991).

The CTE stated that schools are buying more sophisticated technologies such as hard disk drives, laser printers, videodisk players, voice synthesizers, and optical scanners. Also, the CTE reported that teachers on average use computers for between 14 and 15 different applications, and the lack of time, hardware, and administrative support are the more important barriers to the integration of computers into the curriculum.

The California State Department of Education (1988) stated that computers and similar technologies are important instruments in dealing

with the process of improving curriculum and excellence in education. The increasing availability of microcomputers and software possesses a great potential for enhancement of the learning-teaching process. The learner can practice and confirm what has been taught. The educator can improve his/her teaching methods.

McGhan (1985) suggested that education and computers are interactive systems since both are a two-way communication process. Also, computers address Dewey's educational principle of "doing and undergoing."

Feichtner (1989) expressed that computers in education can help students improve their performance. Computer instruction is self-paced. It keeps students' attention on a single activity. Students can recognize their mistakes without additional assistance. Students can receive positive reinforcement on material already learned, and it motivates them to continue learning.

Many authors have reported successful educational outcomes in the use of computers. Kulik and Kulik (1987) suggested that computers are an effective tool for instruction. Jones (1978) found higher scores for those who used computer-assisted instruction. Eighmy and Fuller (1980) reported positive outcomes for the use of computers in farm management. Moore (1986) stated that computers are as successful as the best traditional pedagogical support technologies.

On the other hand, Clark (1983, p. 445) contended that "media are mere vehicles that deliver instruction but do not influence student achievement." Wiggins (1984), Bowen and Agnew (1985), Ogle, Birkenholz, and Stewart (1987) supported the findings of Clark. They reported no

significant difference in student achievement between traditional methods and media used as a complement.

There is not a clear answer to the debate of whether media can improve achievement. Clark (1983) pointed out that computer-assisted instruction is no more effective than traditional methods once the novelty wears off.

Extension has provided instruction in relation to computer use to its clientele. Since the late 1980s, Extension personnel have used computers as an educational tool and carried out practical farmer programs (Rasmussen, 1989).

Wilson (1991) made an important conclusion about the teacher's role. He states that educational technology, no matter how rich and complex, cannot replace good teachers. Educational tools may be used in the learning process as an element for teachers and students to draw on.

CHAPTER III. DESIGN AND METHODOLOGY

The purpose of this study was to assess the extent of the current and future use of educational technologies and to identify barriers that prevent their utilization in Extension. Specific objectives to accomplish this purpose were:

1. To identify the current inventory of several educational technology tools (ETt) available to Extension personnel.
2. To determine the opinion of Extension personnel regarding their knowledge and actual/potential use of ETt to enhance their programs.
3. To identify and quantify which of the following barriers inhibit the greater use of educational technology tools (ETt) in Extension:

   a. Lack of funds
   b. Lack of experience
   c. Conflict with other job responsibilities
   d. Lack of time
   e. Unaware of the technology
   f. No interest in the equipment
   g. Lack of administrative support
   h. Lack of training.

4. To determine the relationships between selected demographic variables and the barriers which may inhibit the use of ETt.
5. To assess the extent of the current and future use of the several educational materials and software.
6. To measure the current use and anticipated use of ETt in three functional areas of Extension (administration and planning, group instruction, and individual instruction).

7. To determine the relationships between selected demographic variables and the current and future use of ETt.

The purpose of this chapter is to describe the research methods and procedures used in this study. The chapter will be divided into four subheadings: Design of the research; population and sample selection; instrumentation; and data collection and analysis.

Design of the Research

The descriptive survey method was used for this study. Mason and Bramble (1978) define "descriptive research" as a broad range of activities that have a common purpose of describing situations or phenomena.

Best (1981, cited in Zidon, 1990) typified descriptive studies in the following way: 1) nonexperimental, 2) involves the use of hypothesis testing, 3) inductive-deductive reasoning used for generalizing, 4) application of randomization methods, and 5) accurate description of the methodology utilized that can allow replication.

Questionnaires and interviews are the most common instruments employed in these kinds of studies. They ascertain opinions, attitudes, preferences, and perceptions of the target sample population (Borg, 1981).

Population and Sample

The population for this study consisted of all Cooperative Extension Service staff in the North Central Region of the United States, which includes the following states: Illinois, Indiana, Iowa, Kansas, Michigan,

Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin).

In 1991 there were 4,870 Extension professional staff members located in these states. They were listed as administrators, state or area specialists, and county agents. The 1991-92 Directory of County Agents published by Century Communications was used as the data base source. The sample was drawn from this source.

The sample size was based upon a review of the literature. Krejcie and Morgan (1970, p. 607) state that the sample size is based upon four factors:

1. the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841),
2. the population size,
3. the population proportion (assumed to be .50 since this would provide the maximum sample size), and
4. the degree of accuracy expressed as a proportion (.05).

From this analysis, the sample size needed for this study would be 357 Extension agents. Zidon (1990) reported a 50.0% response rate in a similar national study. Therefore, to account for an expected low rate (50% or less), the sample size was increased to 1,061 Extension agents in the 12-state North Central Region.

The survey instrument was mailed to a random sample of the Extension staff members. Every fifth state or area specialists' and county agents' name listed in the directory was drawn and mailed a survey questionnaire. All the university administrators were surveyed.

Instrumentation

The ad hoc closed-form questionnaire used in the study was developed by the members of the graduate study committee and is divided into six sections. Section I was designed to collect demographic information while Section II focused on the educational technology tools available to Extension personnel. Section III was designed to illicit responses of agreement/disagreement to educational technology hardware and software used for the enhancement of education. Section IV identified several barriers which may have prevented Extension professionals from using educational technology. Section V was designed to secure information about the extent of the current and future use of educational materials and software. Finally, Section VI was designed to measure the current and expected use of educational technology tools in three major functional areas of Extension: administration and planning, group instruction, and individual instruction.

A five-point Likert-type scale was used to determine the level of agreement of respondents about the statements listed in Section III as follows:

1=Strongly disagree
2=Disagree
3=Neither agree nor disagree
4=Agree
5=Strongly agree

For Section IV, a five-point Likert-type scale was used as follows:

1=This barrier is not limiting in the use of this technology.
2=This barrier mildly limits the use of this technology.
3=This barrier moderately limits the use of this technology.
4=This barrier significantly limits the use of this technology.
5=This barrier completely blocks the use of this technology.
6=Do not know.

For Sections V and VI, the following scale was used:

1=None (0 times/month)
2=Little (1-5 times/month)
3=Frequently (6-10 times/month)
4=Much (11-15 times/month)
5=Nearly always (>15 times/month).

The Iowa State University's Committee on Use of Human Subjects reviewed and approved the survey instrument and methods of collecting data.

To improve the survey instrument and verify it for content validity, a pilot test was performed. A jury of selected ISU personnel and Iowa Extension personnel were asked to fill out the survey and offer their written comments and suggestions. A copy of the survey instrument is found in Appendix B.

Reliability of the instrument was established in the same pilot testing. Reliability coefficient for the entire questionnaire was 0.9869 (Cronbach's alpha). Respondents and non-respondents participating in the pilot testing were excluded from the final random sample.

Data Collection and Analysis

Data collection was accomplished through the use of a mailed questionnaire. Prior to mailing the survey, each state's Extension administrator was contacted to solicit his/her cooperation and to alert his/her staff regarding participation in the study.

The instrument survey was numerically coded for confidentiality and for follow-up purposes.

The mailing consisted of a cover letter explaining the significance of the study, the selection of the sample, a questionnaire, and a pre-addressed, postage-paid return envelope. The first mailing resulted in 530 surveys returned for a rate of 49.90%.

Approximately three weeks following the initial mailing, 50 questionnaires were mailed to non-respondents asking them to respond to a representative sample of 61 questions on the original survey. Replies were received from 18 non-respondents. Their responses were analyzed against the respondents for the sample group to determine significant differences.

Respondents by states

Table 1 shows the number of questionnaires mailed and received by states. The number of questionnaires mailed by state varied from 34 (South Dakota) to 127 (Wisconsin). No state comprised more than 12% of the total sample. The number of respondents by state varied from 16 (North Dakota) to 63 (Kansas). No state comprised more than 12% of the total number of questionnaires returned. The lowest response rate was from Wisconsin (37%), while the highest response rate was from Kansas (67.7%).

The responses obtained from the questionnaire were keypunched into the ISU's mainframe computer, using the computer facility called WYLBUR. A 15% random sample of entered questionnaires was checked for accuracy of information.

Data were stored in a file at the Iowa State University Computation Center. Data were analyzed using the Statistics Package for the Social

Table 1. Number of respondents by state

States	NQM[a]	Percent	NQR[b]	Percent	PR[c]
Illinois	98	9.2	46	8.7	46.9
Indiana	91	8.6	45	8.5	49.4
Iowa	81	7.6	48	9.5	57.2
Kansas	93	8.8	63	11.9	67.7
Michigan	106	10.0	45	8.5	42.5
Minnesota	105	9.9	52	9.8	49.5
Missouri	115	10.8	48	9.5	41.7
Nebraska	71	6.7	34	6.4	47.9
North Dakota	36	3.4	16	3.0	44.4
Ohio	104	9.8	61	11.5	58.6
South Dakota	34	3.2	25	4.7	73.5
Wisconsin	127	12.0	47	8.8	37.0
Totals	1061	100.0	530	100.0	--

[a]NQM-Total number of questionnaires mailed.
[b]NQR-Total number of questionnaires returned.
[c]PR-Percent response.

Sciences (SPSSX) and the Statistical Analysis System (SAS). The .05 level of significance was established a priori as the critical value for all analyses.

The subprograms employed were as follows:

1. FREQUENCIES was performed to obtain descriptive statistics.
2. RELIABILITY ANALYSIS (Cronbach's alpha) was operated to assess the internal consistency of each survey section and of the entire instrument.
3. EXPLORATORY FACTOR ANALYSIS identified which variables of Section III could be described by a smaller number of factors which reveal the difference on opinions.

4. T-TEST and ONEWAY ANOVA were used to determine differences between groups. The Tukey-HSD multiple comparison procedure was used to ascertain multiple comparisons among groups. Also, the T-TEST procedure was used to determine significant differences between early and late respondents.
5. MULTIPLE REGRESSION was performed in an attempt to detect significant differences among variables. Also, it was used to predict influence among variables.
6. CORRELATION was employed to detect relationships among variables.

CHAPTER IV. FINDINGS AND DISCUSSION

This study was undertaken for the purpose of analyzing educational technology tools used by the Cooperative Extension Service in the North Central Region of the United States.

This chapter reports the findings of this study and is divided into the following sections: internal consistency of the survey instrument, differences between respondents' and non-respondents' perceptions on selected items of the survey, a summary of the demographic information, a description of the current inventory of educational technology tools, a factor analysis of Section III, an analysis of barriers that inhibit the use of educational technology tools, multiple regression analysis, results of hypothesis testing, and a summary for the entire chapter.

Internal Consistency of the Survey Instrument

The reliability of a survey instrument is its ability or power to generate the same results on the same number of items under different conditions or at different times. Reliability is expressed as a coefficient that varies from 0.00 to 1.00, where the latter means perfect reliability or a measure is free of error variance (Borg & Gall, 1989). Cronbach's coefficient alpha is the statistical reliability coefficient that is often used.

The survey instrument used in the study was tested for reliability under five categories: 1) the entire instrument; 2) Section III, opinions on educational technology for the enhancement of education, 3) Section IV,

barriers preventing the use of educational technologies, 4) Section V, current and future use of educational materials and software, and 5) Section VI, current and future use of technologies by Extension program functions. The results of the internal consistency tests for the pilot survey test and the final survey are reported in Table 2.

Table 2. Internal consistency of the pilot survey and the final survey

Section of the instrument	Pilot test		Final survey	
	No. variables	Alpha coefficient	No. variables	Alpha coefficient
Entire questionnaire	163	.9869	142	.9375
Section III	20	.8120	20	.3051
Section IV	77	.9918	56	.9501
Section V	24	.9806	24	.9232
Section VI	42	.9279	42	.9474

Nunnally (1982) noted that an alpha greater than 0.65 can be considered to be an acceptable level for research purposes. For this study, the coefficient values were considered to be reliable for the entire survey instrument and its sections.

Section IV of the survey instrument was modified and shortened at the suggestion of the panel of experts. The number of barriers for each technology was reduced from eleven to eight.

The reliability score of Section III decreased from .8120 on the pilot survey to .3051 on the final survey. The pilot test included only Iowa Extension staff, most of which were state specialists and

administrators. They may have shared similar opinions compared to responses from the entire North Central Region.

As a result of the reliability test, it was concluded that the alpha coefficient values were acceptable except for Section III and that statistical analysis could be made. Section III of the survey will be the focus of further analysis.

Respondents and Non-respondents

A total of 1,061 questionnaires were mailed to Extension staff in the North Central Region. Data collection resulted in both usable and non-usable questionnaires. Incorrect addresses and staff unwilling to participate in the study resulted in 31 blank surveys being returned. Usable responses were received from 530 Extension staff members for a response rate of 49.90%.

Fifty non-respondents were randomly selected and surveyed to determine any significant differences between the respondents and non-respondents. A follow-up, mailed survey was used for the non-respondents. In the follow-up survey, 61 items were highlighted as a representative sample of questions on the original survey. Of the 50 non-respondent surveys mailed, responses were received from 18 individuals.

A t-test analysis between respondents and non-respondents was performed using the 61 items on the survey. From Section III of the survey, nine questions were selected for testing. All of the questions from Section IV on barriers, except those related to video technology,

were used to test for significant differences between respondents and non-respondents. Likewise, all the questions on Section VI were used.

The results of the t-test between respondents and non-respondents are found in Appendix A. No significant differences were found between the two groups when comparing their responses on Sections III, IV, and VI. Therefore, it can be concluded that both groups are representative of the population and that the results are generalizable to the population.

Demographic Information

This section describes the demographic characteristics of the respondents. They were characterized according to the following individualities: age, sex, present position, B.S. major field of study, last degree, major of last degree, total years of experience in Extension, group presentations, contacts per week, and number of inservices attended in the last 2, or 3 to 5 years. Frequency distributions were used to present this information.

Age

The findings of the study presented in Table 3 show that the age of Extension professionals was almost evenly distributed into three categories. One hundred eighty-six respondents (35.1%) were in the 26-39 years of age range, 172 (32.5%) were in the 40-49 years of age range, and 172 (32.5%) were in the 50 years of age or older category.

Table 3. Demographic information for the 530 respondents

Variable	Frequency	Percent
Age (Mean=44.8)		
26-39	186	35.1
40-49	172	32.5
50 and over	172	32.5
Total	530	
Sex		
Female	177	33.4
Male	342	64.5
Non-respondents	11	2.1
Total	530	
Present position		
4-H and youth	54	10.2
Home economics	71	13.4
Agricultural	104	19.6
Administrative	67	12.6
Area or state specialist	110	20.8
Other (combination of above)	122	23.0
Non-respondents	22	0.4
Total	530	
B.S. degree--Major field of study		
Agriculture	265	50.0
Home economics	133	25.1
Physical or social sciences or other	132	24.9
Total	530	
Highest academic degree		
Bachelor	94	17.7
Master	284	53.6
Doctoral	146	27.5
Non-respondents	6	1.1
Total	530	
Major of last degree		
Agriculture	178	33.6
Home economics	64	12.1
Social sciences or other	274	51.7
Non-respondents	14	2.6
Total	530	

Table 3. Continued

Variable	Frequency	Percent
Years of Extension experience (Mean=15.2)		
1-10	200	37.7
11-20	182	34.3
21 and over	148	27.9
Total	530	
Number of group presentations per year (Mean=35.4)		
1-20	207	39.1
21-40	158	29.8
41 and over	165	31.1
Total	530	
Number of individualized contacts per week (Mean=30.3)		
1-10	175	33.0
11-30	164	30.9
31 and over	191	36.0
Total	530	
Number of inservices in the last 2 years on ETt (Mean=3.1)		
0	140	26.4
1-2	213	40.2
More than 2	177	33.4
Total	530	
Number of inservices in the last 3-5 years on ETt (Mean=5.7)		
0	112	21.1
1-5	276	52.1
6 and over	142	26.8
Total	530	

Sex

The findings of the study reveal that 342 respondents (64.5%) were male while 177 respondents (33.4%) were female. Eleven respondents did not answer this question. Therefore, there were approximately twice as many male respondents as female respondents. See Table 3 for the results.

Present position

The distribution of respondents by their present Extension position is presented in Table 3. As shown, the highest percentage were those Extension staff that held a combination of different positions (for example, agricultural and administration). They accounted for 23.0% of the total. The second highest position was state specialists (20.8%), while the lowest percentage of Extension staff members were in the 4-H and youth program (10.2%). The data indicate that agriculturalists accounted for 104 (19.6%), home economics for 71 (13.4%), and administrative positions accounting for 67 (12.6%).

B.S. degree--Major field of study

Table 3 shows the distribution of the Extension professionals who participated in the study by their B.S. major field of study. These figures indicate that 265 (50%) people held a bachelor's degree related to agriculture. One hundred thirty-two (24.9%) held a B.S. degree in physical or social sciences or other, while the remaining 133 (25.1%) held a bachelor's degree in home economics.

Highest academic degree

Table 3 indicates that the number of respondents were not equally divided based upon their highest academic degree. The highest number of staff held a master's degree (284, 53.6%). The second highest group (146, 27.5%) were those that had a doctoral degree. The smaller group (94, 17.7%) were those that had a bachelor's degree. Six did not respond.

Major of last degree

Illustrated in Table 3 is the major fields of study for the last academic degree of the participants. Over half of those respondents majored in subjects other than agriculture or home economics for their last degree earned. Approximately one-third majored in agriculture compared to slightly more than 12% in home economics. Fourteen individuals did not respond.

Years of experience

Data in Table 3 revealed that the majority of Extension staff members (200, 37.7%) had 10 or less years of experience. In the category of 11 to 20 years of Extension service, 182 (34.3%) of the participants were found. Finally, 148 (27.9%) had more than 20 years of service.

Group presentations per year

Data on the number of group presentations made by Extension professionals are presented in Table 3. Most of the participants made 20 or fewer group presentations per year (207, 39.1%) followed by slightly

more than 30% who made 41 or more presentations per year. The smallest group (158, 29.8%) were those Extension staff who made 21-40 group presentations per year.

Contacts per week

Table 3 provides information on how many individual contacts (office calls, site visits, counseling, etc.) were made each week by Extension staff members. The groups were nearly equally divided with approximately one-third in each group when grouped by 10 or fewer contacts per week, 11 to 30 contacts per week, or 31 or more contacts per week.

Number of inservices attended

Respondents were asked to indicate how many inservices or parts of an inservice they attended on the use of educational technology in the last 2 years and in the last 3 to 5 years. Responses were grouped into three different categories for each question. Approximately 40% of the respondents (213, 40.2%) had attended one or two inservices on educational technologies during the last 2 years, while over one-third had attended more than two inservices. Therefore, nearly three-fourths of the respondents had attended an inservice on educational technologies during the last 2 years. Similarly, over three-fourths of the respondents had participated in an inservice program during the last 3 to 5 years with over one-half participating in one to five inservices on educational technologies during the last 3 to 5 years.

Inventory of Educational Technology Tools

The respondents were asked to indicate the pieces of educational technology available to them in their Extension offices. Table 4 summarizes the rank order of those pieces. Over 90% of the staff had access to a carousel slide projector, an overhead projector, and a microcomputer. The next most popular items were a VCR player/recorder, an audiocassette player, a microcomputer modem, and a movie projector.

Table 4. Current inventory of educational technology equipment available to Extension professionals (N=530)

Devices	Frequency	Percent
Carousel slide projector	512	96.6
Overhead projector	508	95.8
Microcomputers	496	93.6
VCR player/recorder	467	88.1
Audiocassette player	418	78.9
Microcomputer modem	407	76.8
Movie projector	376	70.9
VCR camera	286	54.0
Satellite downlink	247	46.6
Overhead computer projector	222	41.9
CD-ROM	116	21.9
Interactive videodisk	88	16.6

Factor Analysis of ETt to Enhance Extension Education

One of the objectives of this study was to determine the opinion of Extension personnel regarding the actual and potential use of educational technologies to enhance their programs. Respondents were asked to rate their level of agreement on 20 statements found in Section III of the survey. A five-point Likert scale (1=Strongly disagree; 5=Strongly agree)

was used to score the responses. The mean score for each response is found in Table 5.

Factor analysis is a statistical method employed for data reduction to a smaller number of factors. Each factor is integrated by a set of variables that are moderately or highly correlated with each other (Borg & Gall, 1989).

Two tests which were performed to satisfy the assumptions that underline the model are: non-identity correlation matrix and measure of sampling adequacy.

The Bartlett's test of sphericity was used to test the hypothesis that the correlation matrix is an identity matrix. The Bartlett's test generated a sphericity coefficient of 2542.78; significance = .00. Due to the very small significance of this test, the hypothesis was rejected.

The Kiser-Meyer-Olkin (KMO) test was used to measure sampling adequacy. Kaiser (1970) typified measures in the .90s as marvelous and in the .80s as meritorious.

The Kiser-Meyer-Olkin (KMO) generated a coefficient of .86925. The conclusion from both tests suggested that the data satisfy the assumptions of the model. It became permissible to advance with the factor analysis.

The extraction method employed was Principal Components. Varimax procedure converged in 12 interations. There were five underlying factors suggested by the correlation matrix. The correlation matrix was based on the loading criteria of Eigenvalues greater than one and correlation values .50 or greater. These five factors explained 52.7% of the variance. Table 6 shows the final commonality statistics.

Table 5. Means for 20 statements on use of educational technology tools to enhance programs[a]

Variable	Statement	Mean
X24	I am willing to learn to use new educational technologies.	4.50
X25	I would like to see more ET available for use in Extension.	4.28
X26	ET are more applicable to formal (versus informal) learning situations.	2.62
X27	Administration should provide more accessibility to new ET.	3.93
X28	Currently available ET are sufficient for my needs.	2.95
X29	I do foresee the adoption of new ET by those in Extension.	4.16
X30	ET for use out of the office should be stressed.	3.93
X31	Technical inservices should be emphasized, not the use of new ET.	3.09
X32	Administration should provide adequate time to learn the use of ET.	4.11
X33	Administration should provide adequate resources necessary to adopt new ET.	4.27
X34	Extension staff members should be exposed to ET during their induction training.	4.20
X35	New ET would contribute to a more efficient use of my time.	3.82
X36	New ET should be introduced by experts in those technological fields.	3.71
X37	There is little need for new ET in work.	1.78
X38	ET are changing so fast that I feel that when I become proficient with one, it will soon be out of date.	3.15
X39	Extension agents should not be burdened with the learning of ET as the introduction to new technical material is more important.	3.84
X40	Attendance of workshops that deal with the introduction of new ET should be required.	3.05
X41	I am satisfied with my current knowledge of ET.	2.43
X42	The use of ET has the potential to help me in my work.	4.18
X43	More attention should be devoted to the use of current ET such as computers, VCRs, etc., rather than emerging technologies such as satellite downlink, fiber-optics, networks, etc.	3.01

[a]Rated on a 5-point Likert scale with 1 as "Strongly disagree" and 5 as "Strongly agree."

Table 6. Factors derived from factor analysis

Variable number	Commonality	Factors I	II	III	IV	V
X25	.72	.75				
X24	.65	.73				
X27	.60	.61				
X35	.44	.56				
X30	.35	.55				
X42	.48	.54				
X36	.46	-.52				
X32	.70		.78			
X33	.66		.64			
X34	.52		.64			
X26	.49			.69		
X31	.52			-.53		
X28	.67				-.76	
X41	.40				-.56	
X43	.43					-.64
X40	.47					.59

The five factors generated by principal components underwent reliability analysis. As a result of this analysis, the five factors were reduced to two. Table 7 shows the results of the reliability analysis.

According to Leedy (1985), measures falling between the range of .60 to .79 can be considered as a moderate to marked relationship. Measures under these values can be considered to have from a negligible or chance relationship to a fair degree of relationship.

Based on these criteria, only the first and second factors were considered for further analysis. They are: Factor I, Willingness to use

Table 7. Reliability analysis of five selected factors

Factor	No. of variables	Reliability
I	7	.7936
II	3	.7345
III	2	-.2625
IV	2	-.3997
V	2	-.3997

educational technology and its potential use; and Factor II, Administration and the use of educational technology. Table 8 illustrates the factors and their factor loading.

Barriers in the Use of ETt

Section IV of the survey was designed to rank some of the barriers that have impeded the use of educational technology tools by Extension personnel. The respondents were asked to rate, using a five-point Likert-type scale, the degree of influence that eight barriers may have had in preventing the use of seven different educational technology tools.

The major classifications of educational technology tools were as follows: traditional, computers, video, and emerging. Traditional educational technology tools included the overhead projector, carousel slide projector, movie projector, and the audiocassette tape player. These technology tools have been widely used by Extension personnel for many years. Computer technologies included the microcomputers, minicomputers, computer modems, compact disk ROM, and computer overhead projection units. Video technologies included the VCR player, VCR camera,

Table 8. Factors loading for statements concerning educational technologies (ET)

Factor or statements	Factor
Factor 1: Willingness to use educational technology and its potential use.	
I would like to see more ET available for use in Extension.	.75
I am willing to learn to use new ET.	.73
Administration should provide more accessibility to new ET.	.61
New ET would contribute to a more efficient use of my time.	.56
ET for use out of the office should be stressed.	.55
The use of ET has the potential to help me in my work.	.54
New ET should be introduced by experts in those technological fields.	.52
Factor 2: Administration and the use of ET.	
Administration should provide adequate time to learn the use of ET.	.78
Administration should provide adequate resources necessary to adopt new ET.	.64
Extension staff members should be exposed to ET during their induction training.	.64

and VCR recorder/player. Emerging technology tools were identified as those tools that are beginning to find their way into Extension and included a variety of computer, video, and audio technologies. Included in the emerging technology tools were such things as the satellite uplink/downlink, microwave tower communication systems, fiber-optics transmission land-lines, FM side-bands, and interactive videodisk/computers.

The barriers listed below are the eight possible ones which may have impeded Extension professionals from utilizing the previous educational technologies. They are:

1. Lack of funds
2. Lack of experience
3. Conflict with other job responsibilities
4. Lack of time
5. Unaware of the technology
6. No interest in the equipment
7. Lack of administrative support
8. Lack of training.

For each class of educational technology, participants rated the importance of each barrier according to the following five-point scale:

1. This barrier is not limiting in the use of this technology.
2. This barrier mildly limits the use of this technology.
3. This barrier moderately limits the use of this technology.
4. This barrier significantly limits the use of this technology.
5. This barrier completely blocks the use of this technology.
6. Do not know.

For purposes of the statistical analysis, for those responses identified as "do not know," the value was treated as missing data.

The number of valid cases, means, and standard deviation of the responses related to barriers can be found in Table 9. A discussion of the results follows.

Traditional ETt

From the findings of the study, which are presented in Table 9, it appears that there is no single barrier which limits the use of this technology. All the barrier means fell between 1.10 and 1.56, indicating that the barriers are not limiting or only mildly limit the use of traditional educational tools.

Computer ETt

The data in Table 9 show that only five barriers have mildly restricted the use of this technology tool. The "lack of time" was identified as the most limiting barrier with a mean of 2.608. This was followed by the lack of funds and lack of experience. The other barriers that mildly limit the use of computers include the lack of training and conflict with other job responsibilities. The other barriers had means of less than 2.0, indicating that they are not impeding the use of computers.

Video ETt

With respect to the use of video technologies, the lack of time and funds were the most limiting barriers in the use of this technology. Experience and training ranked lower than computer technology, indicating that Extension had adequate training and experience working with video equipment. Other barriers were ranked less than 2.0 and were not identified as limiting the use of this technology.

Satellite uplink/downlink ETt

The Extension professionals who participated in the study indicated that the lack of funds and experience moderately limited their use of satellite uplink/downlink. The means for both of these were greater than 3.00. The lack of training and lack of time were the next two most limiting barriers with mean scores of 2.876 and 2.657, respectively. Seven out of the eight barriers had mean scores of more than 2.0, indicating that there are more barriers impeding the use of this

Table 9. Valid cases, means, and standard deviations of barriers that have prevented the use of ETt

Barriers	Valid cases[a]	Mean[b]	S.D.
Traditional			
Lack of time	498	1.556	0.903
Lack of funds	501	1.390	0.766
Conflict with other job responsibilities	496	1.358	0.759
Lack of training	492	1.215	0.579
Lack of experience	495	1.182	0.496
No interest in the equipment	498	1.179	0.578
Lack of administrative support	489	1.139	0.489
Unaware of the technology	488	1.109	0.451
Computer			
Lack of time	488	2.608	1.151
Lack of funds	500	2.496	1.173
Lack of experience	492	2.416	1.096
Lack of training	486	2.321	1.117
Conflict with other job responsibilities	493	2.071	1.128
Lack of administrative support	487	1.696	1.025
Unaware of the technology	490	1.667	0.936
No interest in the equipment	491	1.407	0.851
Video			
Lack of funds	497	2.370	1.201
Lack of time	492	2.262	1.155
Lack of experience	498	2.060	1.073
Lack of training	486	2.016	1.048
Conflict with other job responsibilities	487	1.830	1.019
Lack of administrative support	481	1.642	0.932
Unaware of the technology	488	1.446	0.827
No interest in the equipment	489	1.395	0.821
Satellite up/downlink			
Lack of funds	459	3.296	1.376
Lack of experience	466	3.021	1.293

[a]Valid cases do not include any missing data and those respondents who answered "do not know."

[b]Rated on a 5-point Likert scale with 1 as "This barrier is not limiting in the use of this technology" and 5 as "This barrier completely blocks the use of this technology."

Table 9. Continued

Barriers	Valid cases	Mean	S.D.
Lack of training	459	2.876	1.322
Lack of time	455	2.657	1.242
Conflict with other job responsibilities	441	2.329	1.257
Unaware of the technology	455	2.152	1.359
Lack of administrative support	438	2.114	1.273
No interest in the equipment	454	1.858	1.188
Microwave transmissions			
Lack of funds	358	3.986	1.106
Lack of experience	377	3.830	1.161
Lack of training	367	3.730	1.253
Unaware of the technology	378	3.251	1.438
Lack of time	354	2.912	1.330
Lack of administrative support	319	2.821	1.404
Conflict with other job responsibilities	346	2.590	1.372
No interest in the equipment	370	2.314	1.408
Fiber-optics			
Lack of funds	362	4.017	1.181
Lack of experience	382	3.720	1.224
Lack of training	367	3.662	1.310
Unaware of the technology	381	3.160	1.445
Lack of time	360	2.864	1.319
Lack of administrative support	327	2.761	1.437
Conflict with other job responsibilities	350	2.560	1.354
No interest in the equipment	372	2.175	1.373
Interactive videodisk			
Lack of funds	378	4.069	1.028
Lack of experience	398	3.661	1.172
Lack of training	394	3.604	1.286
Unaware of the technology	402	3.047	1.466
Lack of time	383	2.903	1.302
Lack of administrative support	351	2.812	1.360
Conflict with other job responsibilities	370	2.595	1.349
No interest in the equipment	391	2.197	1.366

educational technology tool as compared to computer, video, or traditional technologies.

Microwave transmissions ETt

The data in Table 9 summarize the responses of the Extension staff with regard to barriers that impede the use of microwave transmission technologies. For this technology, all eight barriers were mildly limiting the use of this technology. The lack of funds (mean=3.986) and the lack of experience (mean=3.830) were rated as the most limited barriers. They were followed by the lack of training and Extension staff being unaware of this technology, with means of 3.730 and 3.251, respectively. This indicates that Extension professionals know little about this educational technology and lack experience in its use. Also, funds are generally not available to use it in their Extension programs.

Fiber-optics ETt

Fiber-optics is a relatively new technology available for the transmission of information via Extension programs. As with microwave transmission, all eight barriers were at least mildly limiting the use of this technology. The lack of funds significantly limits the use of this technology with a mean of 4.017. Other barriers moderately limiting the use of this technology include the lack of experience (3.720), lack of training (3.662), and unaware of this technology (3.160). These data should suggest that Extension personnel have limited funds available to use this technology and lack experience using it.

Interactive videodisk ETt

Many of the same barriers are limiting the use of this technology as compared to the other merging educational technologies. Again, the lack of funds is the most limiting with the respondents indicating that this barrier is significantly limiting the use of this technology. The lack of experience, lack of training, and unaware of this technology all are moderately limiting the use of this emerging educational technology.

From the previous findings it is clear that the most important barriers affecting the use of computers, videos, and satellite uplink/ downlink in Extension are: lack of time, lack of funds, and lack of experience.

On the other hand, lack of funds, lack of training, and lack of experience were identified as the most important barriers that have affected the use of microwave transmissions, fiber-optics, and interactive videodisk. These barriers were found to be moderately to significantly limiting. Also, with many of the newest educational technology, Extension professionals were unaware of the educational technology and that barriers were inhibiting the use of emerging educational technologies in Extension programs.

The lack of funds was identified as the most limiting barrier for all emerging educational technology tools and for video technology tools. Ample funding appears to be available for traditional tools and computers. On the other hand, the lack of time available to Extension professionals is limiting the use of traditional and computer technologies.

Multiple Regression Analysis

Multiple regression analysis is a statistical technique used to determine the strength of a relationship between a set of independent variables (Xs) and one dependent variable (Y) (Borg & Gall, 1989). Stepwise multiple regression is the computer procedure employed for performing multiple regression analysis. It examines one independent variable at a time for entry into the regression equation. Independent variables (Xs) are added in decreasing order of their contribution to the multiple correlation coefficient (R), the coefficient of determination (R^2), and the F statistics. Each new variable contributes less to R than the previous one. The regression equation is recomputed each time until no variables are left or no variables not in the equation contribute to increase the equation's statistics.

Stepwise multiple regression was employed to determine which of the independent variables--age of the Extension professionals, sex of the Extension professionals, present position of the Extension professionals, highest academic degree held by Extension professionals, major of last degree held by Extension professionals, years of experience of Extension professionals, group presentations by year of Extension professionals, contacts per week by Extension staff, and number of inservices that Extension staff have attended on ETt in the last 2, and 3 to 5 years--contributed to the explanation of the variance of any of the two determined factors: Factor I - Willingness to use educational technology and its potential use; and Factor II - Administration and the use of educational technology.

Data in Table 10 show that the age of Extension professionals, number of inservices that Extension staff have attended on ETt in the last 2 years, and group presentations by year of Extension professionals were the three best predictor variables for Factor I. These variables explained 6.0% of the Factor I's variance. The independent variable, age of Extension professionals, presents the highest correlation (.160) of the regression model in Table 10.

Table 10. Multiple analysis regression on Factor I

Variable	Multiple R	R square	F-value	Prob.
Variable entered on step number 1: Age	.160	.025	13.17	.000
Variable entered on step number 2: Number of inservices	.226	.051	13.42	.000
Variable entered on step number 3: Group presentation	.244	.059	10.57	.000

	Variables in the equation				
Variable	B[a]	SE B	Beta	t-value	Prob.
Age	-.203	.052	-.167	-3.83	.000
Number of inservices	.204	.056	.156	3.60	.000
Group presentation	.112	.052	.094	2.15	.031
(Constant)	-.242	.186		-1.30	.193

[a]Partial regression coefficients.

Data in Table 11 show that sex of Extension professionals and contacts per week by Extension staff were the best predictors for Factor II. These variables accounted for 1.7% of the Factor II's variance. Data from Table 11 also show that correlation between sex of Extension professionals and Factor II is .095.

Table 11. Multiple analysis regression on Factor II

Variable	Multiple R	R square	F-value	Prob.
Variable entered on step number 1: Sex	.095	.009	4.60	.032
Variable entered on step number 2: Contacts per week	.130	.017	4.30	.014

	Variables in the equation				
Variable	B[a]	SE B	Beta	t-value	Prob.
Sex	-.200	.088	-.100	-2.26	.023
Contacts per week	.107	.053	.088	1.99	.046
(Constant)	.120	.185		.65	.513

[a]Partial regression coefficients.

Results of Hypotheses Testing

Several hypotheses were formulated for testing. The null hypotheses were listed in Chapter I. This section presents the results from those tests.

Hypothesis 1

Hypothesis 1 was stated as:

For all Extension professionals in the North Central Region, there are no significant differences in the barriers which may have prevented them from utilizing ETt when grouped by: a) traditional, b) computer, c) video, d) satellite uplink/ downlink, e) microwave transmission, f) fiber-optics, and g) interactive videodisk.

$$HO1: \mu_a = \mu_b = \ldots = \mu_g.$$

Analysis of variance was used to determine whether the seven technology means were significantly different for all respondents for the different barriers. The results are shown in Table 12. A grand mean score, by educational technology tool, over all barriers was calculated for the analysis. The differences in the barriers among the various educational technology tools were found to be significantly different at the .01 level. Therefore, the null hypothesis was rejected. It is concluded that there are significant differences in the barriers which may have prevented Extension personnel from utilizing the several technologies.

Table 12. Analysis of variance of the several barriers that may have inhibited the use of educational technology tools[a]

Source	DF	SS	MS	F-ratio	Prob.
Between groups	6	1714.48	285.74	407.40	.000**
Within groups	3317	2326.31	0.70		
Total	3323	4040.79			

[a]Traditional, computer, video, satellite up/downlink, microwave transmission, fiber-optics, and interactive videodisk.

**Significant at the .01 level.

Hypothesis 2

The second hypothesis dealt with the difference in the barriers which may have prevented Extension personnel in each state from utilizing educational technologies. Hypothesis 2 was stated as:

> For all Extension professionals in each state in the North Central Region, there are no significant differences in thebarriers which may have prevented them from utilizing ETt when grouped by: a) traditional, b) computer, c) video, d) satellite uplink/downlink, e) microwave transmission, f) fiber-optics, and g) interactive videodisk.

$$HO2: \quad \mu_1 = \mu_2 = \ldots = \mu_{12}.$$

An analysis of variance was conducted to determine if there were significant differences in the barriers for the seven technologies when grouped by state. A grand mean score for each state was calculated for each ETt over all barriers.

As noted in Table 13, the analysis of variance showed significant differences in the cases of satellite up/downlink technology and microwave technologies and the null hypothesis was rejected. Therefore, there are significant differences in the barriers which may have prevented Extension personnel among different states from utilizing satellite up/downlink and microwave transmission technologies. The Tukey-HSD multiple comparison procedure pinpointed the differences. This test located significant differences at the .01 level among states as follows: For satellite up/downlink technology, the analysis showed that "Iowa" is significantly different from Illinois, Kansas, Michigan, Minnesota, and North Dakota.

Table 13. Analysis of variance of several barriers that may have inhibited the use of educational technologies among states

Source	DF	SS	MS	F-ratio	Prob.
Traditional					
Between groups	11	2.08	.18	1.01	.428
Within groups	491	91.16	.18		
Total	502	93.24			
Computer					
Between groups	11	9.65	.87	1.78	.054
Within groups	493	242.60	.49		
Total	504	252.25			
Video					
Between groups	11	4.24	.38	.72	.719
Within groups	488	261.32	.53		
Total	499	265.56			
Satellite up/downlink					
Between groups	11	54.05	4.91	5.54	.001**
Within groups	472	418.52	.88		
Total	483	472.57			
Microwave transmission					
Between groups	11	19.59	1.78	1.96	.030*
Within groups	405	367.82	.90		
Total	416	387.42			
Fiber-optics					
Between groups	11	15.40	1.40	1.43	.154
Within groups	406	396.20	.97		
Total	417	411.60			
Interactive videodisk					
Between groups	11	10.10	.91	1.04	.402
Within groups	422	369.99	.87		
Total	433	380.10			

*Significant at the .05 level.
**Significant at the .01 level.

Also, the findings showed that "Wisconsin" is significantly different from Illinois, Kansas, and Michigan. In relation to microwave transmission, the Tukey-HSD procedure indicated that "Indiana" was significantly different from Kansas and Ohio. In other words, there are significant differences in the barriers which may have prevented Iowa, Wisconsin, and Indiana from utilizing satellite up/downlink and microwave transmission technologies, respectively, from the states listed above. Table 14 shows the mean and standard deviation for each state.

Hypothesis 3

The third hypothesis dealt with the relationship between the barriers and the demographic data. Hypothesis 3 was stated as:

> There is no relationship between the barriers which may have prevented Extension personnel from utilizing different classes of educational technology equipment and the following demographic variables:
>
> a. Extension personnel's age
> b. Extension personnel's sex
> c. Extension personnel's present position
> d. Extension personnel's major
> e. Extension personnel's education (highest degree held)
> f. Extension personnel's years of experience
> g. Extension personnel's number of group presentations per year
> h. Extension personnel's number of inservices attended (2 and 3-5 years).

According to Hinkle, Wiersma, and Jurs (1988), measures falling in the .50s to .30s can be interpreted as having low positive (negative) correlation. Measures falling in the .30s to .00s can be interpreted as

Table 14. Means[a] and standard deviations for all barriers by ETt and state

States	Traditional		Computer		Video		Satellite		Microwave		Fiber-op.		Interactive	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
General	1.27	.45	2.09	.70	1.90	.72	2.60	.98	3.27	.97	3.20	.96	3.18	.94
Illinois	1.25	.46	1.87	.57	1.97	.69	3.04	1.05	3.33	.95	3.16	1.07	3.25	1.05
Indiana	1.36	.55	2.19	.58	1.81	.61	2.52	.90	2.71	.98	3.01	.95	2.92	.88
Iowa	1.31	.41	2.23	.68	1.89	.83	1.96	.80	3.29	1.04	3.21	1.01	3.21	.99
Kansas	1.27	.42	2.18	.73	2.04	.78	2.94	1.05	3.53	.87	3.43	.98	3.42	.94
Michigan	1.24	.47	1.98	.68	1.90	.64	3.03	.92	3.39	1.01	3.25	1.06	3.15	.97
Minnesota	1.19	.34	1.96	.64	1.91	.78	2.63	.87	3.12	.99	2.98	.85	3.01	.86
Missouri	1.35	.50	2.26	.62	2.00	.69	2.55	.84	3.33	.92	3.36	.98	3.27	.83
Nebraska	1.36	.49	2.26	.89	1.98	.80	2.49	.86	3.18	.87	3.11	.92	3.08	.82
N. Dakota	1.36	.58	2.02	.71	1.85	.80	2.90	1.15	3.44	1.06	2.73	1.20	3.23	1.08
Ohio	1.20	.33	2.14	.83	1.77	.68	2.52	.98	3.40	.97	3.42	1.00	3.28	.95
S. Dakota	1.84	.67	1.84	.67	1.72	.81	2.69	1.08	3.16	.89	3.13	.90	3.03	1.18
Wisconsin	1.20	.34	1.99	.68	1.84	.63	2.13	.86	3.29	.99	3.27	1.01	3.22	.90

[a]Rated on a 5-point Likert scale with 1 as "This barrier is not limiting in the use of this technology," and 5 as "This barrier completely blocks the use of this technology."

having little if any correlation. For the purposes of testing hypotheses, measures at .30 or below are considered to be no relationship.

Table 15 shows the results of the correlation analysis. Only low to nonexistent correlations among the barriers and the various demographic variables for each educational technology were found. Therefore, the hypothesis was not rejected. However, significant correlations were found and are listed as follows:

1. For the traditional ETt, there was a positive correlation between age and the conflict of other job responsibilities, lack of time, and unaware of this technology. There was a negative correlation between major field of study and lack of time and lack of administrative support.

2. For the computer ETt, negative correlations were found between age and lack of funds, last degree and lack of time, and number of group presentations and lack of administrative support. Positive correlations were found between age and lack of experience, and age and conflict with other job responsibilities.

3. For the video ETt, positive correlations were found between age and lack of experience, while negative significant correlations were found between number of group presentations per year and lack of experience, major field of study and lack of time, last degree and unaware of the technology, major field of study and lack of administrative support, and the number of group presentations and lack of training.

4. For the satellite uplink/downlink technology, negative correlations were found between degree and lack of funds, degree and lack

Table 15. Means, standard deviations, and correlation of Extension personnel's demographic data and several barriers in the use of educational technologies

Barriers	Mean[a]	SD	X1[b]	X2[c]	X3[d]	X4[e]	X5[f]	X6[g]	X7[h]	X8[i]	X9[j]
					Traditional						
Lack of funds	1.39	.76	-.02	-.06	.02	.03	-.02	-.02	-.03	.04	.02
Lack experience	1.18	.49	.08	.01	-.00	-.00	-.00	.03	.05	.06	.08
Conflict with job	1.35	.76	.12**	.07	.07	-.06	.06	.04	-.03	.05	.07
Lack of time	1.55	.90	.14**	.11**	.08	-.09**	.05	.08	-.02	.02	.05
Unaware of technology	1.10	.45	.12**	-.00	.04	.03	-.08	.08	.00	.06	.06
No interest in equip.	1.17	.58	.04	.03	.01	.00	-.02	.02	-.03	-.02	.03
Lack admin. support	1.13	.48	-.03	.03	.03	-.11**	-.00	-.01	-.00	-.01	.01
Lack training	1.21	.58	.07	.03	-.00	-.01	-.07	.09*	.03	.05	.11*
					Computer						
Lack of funds	2.49	1.17	-.16**	-.11*	.00	.01	-.08	-.10*	.00	-.01	.01
Lack experience	2.41	1.09	.09*	-.06	.00	.07	-.06	.11*	-.03	-.03	-.00
Conflict with job	2.07	1.12	.10*	-.00	-.04	.02	-.08	.09*	.01	.00	-.00
Lack of time	2.60	1.15	.09*	-.03	-.00	.04	-.12**	.04	.02	-.03	.02

[a]Rated on a 6-point Likert scale with 1 as "This barrier is not limiting in the use of this technology," and 6 as "This barrier completely blocks the use of this technology."

[b]X1=age.

[c]X2=sex.

[d]X3=present position.

[e]X4=major.

[f]X5=degree.

[g]X6=years of experience.

[h]X7=number of group presentations per year.

[i]X8=number of inservices attended in last 2 years.

[j]X9=number of inservices attended in last 3-5 years.

*Significant at the .05 level.

**Significant at the .01 level.

Table 15. Continued

Barriers	Mean	SD	X1	X2	X3	X4	X5	X6	X7	X8	X9
Unaware of technology	1.66	.93	-.04	-.07	-.02	-.01	-.07	.01	.00	-.04	-.03
No interest in equip.	1.40	.85	.08	-.00	-.05	.00	.00	.02	.02	-.04	.01
Lack admin. support	1.69	1.02	-.06	.01	-.02	-.04	-.00	-.09*	.04	-.06	-.03
Lack training	2.32	1.11	-.01	-.07	-.05	.05	-.07	-.00	-.00	-.06	-.00
					Video						
Lack of funds	2.37	1.20	-.06	-.00	.06	-.08	-.06	-.02	-.07	-.06	-.04
Lack experience	2.06	1.07	.10*	.02	.04	-.07	.01	.02	-.09*	-.06	-.02
Conflict with job	1.82	1.01	.06	.03	.07	-.07	.05	-.02	-.07	-.05	-.01
Lack of time	2.26	1.15	.04	.07	.05	-.09*	.02	-.04	-.07	-.05	-.02
Unaware of technology	1.44	.82	.02	-.05	-.05	.00	-.09*	-.00	-.04	-.03	.03
No interest in equip.	1.39	.82	.06	.01	.01	-.02	.04	-.02	-.09*	.00	.03
Lack admin. support	1.64	.93	-.01	.08	.06	-.09*	-.01	-.02	-.04	-.08	-.02
Lack training	2.01	1.06	.07	-.00	.01	-.07	.00	.02	-.09*	-.07	-.02
					Satellite uplink/downlink						
Lack of funds	3.29	1.37	-.09*	-.10*	-.02	-.04	-.14**	-.06	-.03	.01	-.01
Lack experience	3.02	1.29	-.00	-.02	.01	-.06	-.13**	-.00	-.05	-.07	-.08
Conflict with job	2.32	1.25	.01	-.03	.00	-.07	-.02	-.04	-.07	.00	-.02
Lack of time	2.65	1.24	.01	.06	.04	-.03	-.00	-.04	-.06	-.03	-.05
Unaware of technology	2.15	1.35	-.14**	-.09*	-.04	-.06	-.14**	-.05	-.03	-.03	-.03
No interest in equip.	1.85	1.18	-.05	-.02	-.05	-.10*	-.05	-.06	-.03	-.04	-.02
Lack admin. support	2.11	1.27	-.16**	-.08	.03	-.04	-.20**	-.10**	-.02	-.00	.00
Lack training	2.87	1.32	-.06	-.03	.01	-.05	-.15**	-.02	-.03	-.08	-.05
					Microwave transmissions						
Lack of funds	3.98	1.10	-.18**	-.21	-.05	-.08	-.23**	-.08	.03	-.04	-.07
Lack experience	3.83	1.16	-.04	-.15**	-.04	-.03	-.12*	-.02	-.02	-.11*	-.12
Conflict with job	2.58	1.37	-.01	-.04	.00	-.09	-.02	-.03	-.09	-.02	-.02
Lack of time	2.91	1.32	-.02	-.00	-.00	-.08	.00	-.02	-.07	-.07	-.04
Unaware of technology	3.25	1.43	-.07	.12*	-.06	-.05	-.10*	-.06	-.04	-.06	-.09

Table 15. Continued

Barriers	Mean	SD	X1	X2	X3	X4	X5	X6	X7	X8	X9
No interest in equip.	2.31	1.40	-.03	-.00	-.04	-.07	-.03	-.07	-.03	-.07	-.05
Lack admin. support	2.82	1.40	-.18**	-.10	.00	-.08	-.17**	-.11*	-.06	-.00	-.02
Lack training	3.73	1.25	-.08	-.10	-.03	-.05	-.14**	-.04	-.01	-.06	-.03
				Interactive videodisk							
Lack of funds	4.06	1.02	-.17**	-.20**	-.07	-.03	-.20**	-.13**	.06	-.07	-.11*
Lack experience	3.66	1.17	.00	-.15**	-.01	.01	-.13**	.02	.07	-.11*	-.12*
Conflict with job	2.59	1.34	.06	-.01	.01	-.03	.00	.03	-.01	.01	.01
Lack of time	2.90	1.30	.03	.03	.05	-.04	.05	.02	-.12*	.00	.00
Unaware of technology	3.04	1.46	.01	-.10**	-.05	.01	-.13**	.00	.03	-.11*	-.10*
No interest in equip.	2.19	1.36	-.00	-.02	-.03	.03	-.03	-.01	-.05	-.06	-.04
Lack admin. support	2.81	1.36	-.12	.06	.04	-.06	-.11	-.07	-.01	-.02	-.00
Lack training	3.60	1.28	.00	-.07	-.05	.05	-.14**	-.04	.07	-.01	-.01
				Fiber-optics							
Lack of funds	4.01	1.18	-.22**	-.18*	-.11*	-.01	-.25**	-.13**	.08	-.08	-.12*
Lack experience	3.71	1.22	-.06	-.16**	-.07	-.00	-.15**	-.02	.03	-.14*	-.14**
Conflict with job	2.56	1.35	.02	-.03	-.00	-.04	.00	-.01	-.06	-.05	-.03
Lack of time	2.86	1.31	-.01	.02	.00	-.04	.03	-.03	-.11*	-.09	-.04
Unaware of technology	3.16	1.44	-.06	-.09	-.04	-.03	-.07	-.05	.00	-.09	-.10*
No interest in equip.	2.17	1.37	-.04	-.01	-.03	-.06	-.03	-.06	-.02	-.08	-.10
Lack admin. support	2.76	1.43	-.15**	-.10	.02	-.08	-.15**	-.13*	-.02	-.06	-.07
Lack training	3.66	1.31	-.06	-.04	-.03	-.02	-.14**	-.01	.04	-.06	-.04

of experience, age and unaware of the technology, degree and unaware of the technology, age and the lack of administrative support, and degree and the lack of training.

5. For the microwave transmission technology, negative correlations were found between age and lack of funds, degree and lack of funds, degree and lack of experience, number of inservices attended in last 2 years, degree and unaware of technology, age and lack of administrative support, degree and lack of administrative support.

6. For the fiber-optics technology, several negative correlations were found including negative correlations between the lack of funds and age, present position, degree, years of experience, and number of inservices attended in the last 3 to 5 years. Negative correlations were also found between the lack of experience and sex, degree, and the number of inservices in the last 3 to 5 years. Other negative correlations were found between lack of administrative support and age, degree, and years of experience.

7. For the interactive videodisk technology, negative correlations were found between lack of funds and age, degree, years of experience, and number of inservices attended in the last 3 to 5 years. The lack of experience was negatively correlated with degree, number of inservices attended in the last 2 years, and the number of inservices attended in the last 3 to 5 years. Likewise, negative correlations were found between unaware of the technology, degree, number of inservices attended in the last 2 years, and number of inservices attended in the last 3 to 5 years.

Hypothesis 4

The fourth hypothesis was to determine significant differences in the current use and anticipated use of three forms of hardware/software employed by Extension professionals. Hypothesis 4 was stated as follows:

> There is no significant difference in the extent to which Extension personnel currently use and anticipate using the following types of educational materials and software: a) traditional programs, b) teaching aids, and c) other forms.

$$H04: \mu_{\text{currently use}} = \mu_{\text{anticipate using}}.$$

Traditional programs included spreadsheets, word processing, data base management, and telecommunications. Teaching aids included presentation graphics, tutorial programs, drill/practice programs, simulation programs, decision aid programs, and expert systems. Other forms included videotapes and information/data base services.

Paired t-tests were used to test the differences. Table 16 shows that significant differences were found and the null hypothesis was rejected. It appears that over the next 2 years, Extension personnel expect to increase their use of the traditional programs, teaching aids, and other forms of educational materials and software.

Hypothesis 5

The fifth hypothesis was to determine if Extension personnel among different states have similar perceptions related to the extent of the use of educational technologies. Hypothesis 5 was stated as follows:

Extension personnel among different states of the North Central Region have similar perceptions related to the extent of the current use and anticipated use of the following types of educational materials and software: a) traditional programs, b) teaching aids, and c) other forms.

HO5: $\mu_1 = \mu_2 = \ldots = \mu_{12}$ Current use.

HO5: $\mu_1 = \mu_2 = \ldots = \mu_{12}$ Future use.

Traditional programs included spreadsheets, word processing, data base management, and telecommunications. Teaching aids included presentation graphics, tutorial programs, drill/practice programs, simulation programs, decision aid programs, and expert systems. Other forms included videotapes and information/data base services.

Table 16. Paired t-test analysis of educational materials and software

Type of use	Mean[a]	S.D.	t-value	t-prob.
Traditional programs				
Current use	2.89	1.01	-12.26	.000**
Anticipated use	3.31	1.00		
Teaching aids				
Current use	1.65	0.68	-17.57	.000**
Anticipated use	2.21	0.86		
Other forms				
Current use	2.40	1.02	-17.56	.000**
Anticipated use	3.01	1.11		

[a]Rated on a 5-point Likert scale with 1 as "None (0 times/month)" and 5 as "Nearly always (>15 times/month)."

**Significant at the .01 level.

The current and future use of traditional programs, teaching aids, and other forms of educational materials and software as perceived by Extension personnel of different states of the North Central Region are the same. Table 17 shows that the current and anticipated use of these educational materials and software are not significantly different. Therefore, the null hypothesis was accepted.

Table 18 contains means and standard deviations by state for each of the three forms of educational materials and software.

Hypothesis 6

The sixth hypothesis was to determine if a relationship existed between the value Extension personnel placed on the current use and anticipated use of educational materials and software and the various demographic data. Hypothesis 6 was stated as:

> There is no relationship in the extent to which Extension personnel currently use and anticipate using the different types of educational materials and the following demographic variables:
>
> a. Extension personnel's age
> b. Extension personnel's sex
> c. Extension personnel's present position
> d. Extension personnel's number of group presentations per year
> e. Extension personnel's number of inservices attended in last 2 years
> f. Extension personnel's number of inservices attended in last 3 to 5 years
> g. Extension personnel's years of experience
> h. Extension personnel's major
> i. Extension personnel's education (highest degree held).

Table 17. Analysis of variance of current and future use of traditional programs, teaching aids, and other forms of educational technologies among states

Source	DF	SS	MS	F-ratio	Prob.
Current use of traditional programs					
Between groups	11	18.51	1.68	1.55	.10
Within groups	499	539.43	1.08		
Total	510	557.94			
Current use of teaching aids					
Between groups	11	4.69	.42	.82	.61
Within groups	490	254.10	.51		
Total	501	258.79			
Current use of other forms					
Between groups	11	20.72	1.88	1.68	.07
Within groups	492	551.10	1.12		
Total	503	571.83			
Anticipated use of traditional programs					
Between groups	11	19.06	1.73	1.79	.06
Within groups	443	438.98	.99		
Total	454	458.05			
Anticipated use of teaching aids					
Between groups	11	8.64	.78	1.06	.38
Within groups	456	336.43	.73		
Total	467	345.08			
Anticipated use of other forms					
Between groups	11	18.33	1.66	1.34	.19
Within groups	441	548.39	1.24		
Total	452	566.73			

Table 18. Means and standard deviations of the current and anticipated use by state of educational technologies and software

States	Current use		Anticipated use	
	Mean[a]	S.D.	Mean[a]	S.D.
Traditional programs				
Illinois	3.07	1.06	3.40	1.10
Indiana	2.86	1.23	3.05	1.17
Iowa	3.12	.98	3.64	1.17
Kansas	2.69	1.06	3.17	.96
Michigan	3.20	1.06	3.50	.88
Minnesota	2.93	1.05	3.31	1.03
Missouri	2.83	.88	3.10	.89
Nebraska	3.23	.99	3.60	.95
North Dakota	2.89	1.00	3.37	1.06
Ohio	2.77	1.06	3.04	1.00
South Dakota	3.35	.99	3.47	1.08
Wisconsin	2.91	.96	3.34	.93
Teaching aids				
Illinois	1.55	.58	2.18	.83
Indiana	1.56	.82	2.00	.84
Iowa	1.75	.72	2.26	.82
Kansas	1.60	.63	2.16	.85
Michigan	1.84	.79	2.47	.89
Minnesota	1.73	.80	2.21	.94
Missouri	1.61	.52	2.05	.76
Nebraska	1.80	.80	2.45	.97
North Dakota	1.62	.52	2.25	.97
Ohio	1.68	.64	2.10	.83
South Dakota	1.86	1.05	2.35	.72
Wisconsin	1.66	.69	2.21	.82
Other programs				
Illinois	2.08	.94	2.97	1.15
Indiana	2.53	1.03	3.13	1.25
Iowa	2.64	1.08	3.31	1.25
Kansas	2.35	1.09	2.92	1.10
Michigan	2.64	1.04	3.28	.99
Minnesota	2.57	1.18	3.05	1.26
Missouri	2.33	1.10	2.78	1.08
Nebraska	2.71	1.09	3.12	1.12
North Dakota	2.59	1.34	3.00	1.55
Ohio	2.25	.85	2.74	.92
South Dakota	2.71	1.19	3.41	1.12
Wisconsin	2.19	.94	2.82	.93

[a]Rated on a 5-point Likert scale with 1 as "None (0 times/month)" and 5 as "Nearly always (>15 times/month)."

Pearson product moment correlations were used to test this hypothesis. The results of these correlations are shown in Tables 19 and 20. All correlations were found to be low to nonexistent. Therefore, the hypothesis was not rejected.

For the current use of educational materials and software, there were significant positive and/or negative correlations between the following independent variables and the various forms of educational software and materials: sex, present position, group presentations per year, number of inservices attended in the last 2 years, number of inservices attended in the last 3 to 5 years, major field of study, and education. However, little or no relationship was found between the extent to which personnel currently use the different types of educational materials and software and the demographic variables. These results are summarized as follows:

1. Spreadsheets were positively correlated with present position and degree. They were negatively correlated with major field of study.

2. Word processing was positively correlated with degree.

3. Data base management programs were positively correlated with number of group presentations per year, number of inservices attended in last 2 years, and number of inservices attended in the last 3 to 5 years.

4. Telecommunications were positively correlated with number of inservices attended in the last 2 years and degree. It was negatively correlated with the major field of study.

5. Presentation graphics were positively correlated with the number of group presentations per year and degree.

Table 19. Correlation between the current use of educational materials and software and the various demographic variables

Materials	Mean[a]	SD	X1[b]	X2[c]	X3[d]	X4[e]	X5[f]	X6[g]	X7[h]	X8[i]	X9[j]
Spreadsheets	2.3	1.33	-.05	-.30**	-.13**	-.07	.08	.07	-.02	-.30**	.08*
Word processing	3.9	1.41	-.04	-.02	.04	.03	-.04	.03	-.08	-.01	.10**
Data base management	2.5	1.39	.00	.01	-.02	.12**	.11*	.14**	.00	.00	.04
Telecommunications	2.8	1.47	.03	.09*	-.01	.06	.11*	.13	-.00	-.09*	.11**
Presentation graphics	2.3	1.28	.05	.06	.04	.13**	.05	.03	-.04	-.04	.15**
Tutorial programs	1.5	.90	.01	-.06	-.04	.09*	.11*	.13**	-.05	.05	-.03
Drill/practice programs	1.2	.61	.01	-.02	-.04	.08	.09*	.10*	-.03	-.06	.07
Simulation programs	1.4	.81	.02	.12**	.01	.06	.09*	.12*	-.00	.12**	.05
Decision aid programs	1.8	1.11	-.03	.15**	.02	.10*	.09*	.10*	-.00	-.08	-.00
Expert systems	1.4	.86	.03	.02	-.05	.03	.10*	.11*	-.03	-.07	.03
Videotapes	2.8	1.24	.04	-.16**	-.09	.13**	.06	.07	.05	.11**	-.09
Info/data base serv.	2.0	1.20	.03	.01	-.08	.06	.18**	.19**	.00	.02	.04

[a]Rated on a 5-point Likert scale with 1 as "None (0 times/month)" and 5 as "Nearly always (>15 times/month)."
[b]X1=age.
[c]X2=sex.
[d]X3=present position.
[e]X4=number of group presentations per year.
[f]X5=number of inservices attended in the last 2 years.
[g]X6=number of inservices attended in the last 3 to 5 years.
[h]X7=years of experience.
[i]X8=major.
[j]X9=degree.
*Significant at the .05 level.
**Significant at the .01 level.

Table 20. Correlation between the anticipated use of educational materials and software and the various demographic variables

Materials	Mean[a]	SD	X1[b]	X2[c]	X3[d]	X4[e]	X5[f]	X6[g]	X7[h]	X8[i]	X9[j]
Spreadsheets	2.7	1.28	.03	.22**	.14*	.10*	-.11*	.16*	-.03	-.08	.01
Word processing	4.1	1.23	-.07	-.11*	.00	.10*	-.02	.02	-.10*	.02	.06
Data base management	3.0	1.38	-.03	-.01	-.03	.11**	.15*	.21	-.04	.05	-.01
Telecommunications	3.3	1.37	-.02	.01	-.02	.12**	.16**	.21**	.00	.01	.05
Presentation graphics	3.0	1.27	-.05	.00	.00	.01**	.07	.11**	-.10*	.00	.10*
Tutorial programs	2.0	1.12	-.16**	-.07	-.11*	.12**	.16**	.17**	-.14**	-.01	-.12**
Drill/practice programs	1.5	.85	-.13**	-.02	-.13*	.04	.19**	.12**	-.13**	-.05	-.07
Simulation programs	2.0	1.07	-.03	.09	-.06	.07	.14**	.18**	-.08	-.09*	-.02
Decision aid programs	2.4	1.25	-.09	.14**	.00	.15*	.14*	.20**	-.03	-.10*	-.03
Expert systems	2.0	1.16	-.03	.06	.02	.11*	.23**	.27*	-.05	-.10*	.00
Videotapes	3.2	1.21	.00	-.15**	-.15**	.14*	.12**	.12**	.03	.06	-.12**
Info/data base serv.	2.7	1.33	-.04	-.07	-.10*	.13*	.18**	.22**	-.02	.07	-.02

[a]Rated on a 5-point Likert scale with 1 as "None (0 times/month)" and 5 as "Nearly always (>15 times/month)."
[b]X1=age.
[c]X2=sex.
[d]X3=present position.
[e]X4=number of group presentations per year.
[f]X5=number of inservices attended in the last 2 years.
[g]X6=number of inservices attended in the last 3 to 5 years.
[h]X7=years of experience.
[i]X8=major.
[j]X9=degree.
*Significant at the .05 level.
**Significant at the .01 level.

6. Tutorial programs were positively correlated with the number of group presentations per year, number of inservices attended in the last 2 years, and number of inservices attended in the last 3 to 5 years.

7. Drill/practice programs were positively correlated with the number of inservices attended in the last 2 years and the number of inservices in the last 3 to 5 years.

8. Simulation programs were positively correlated with number of inservices attended in the last 2 years and the number of inservices attended in the last 3 to 5 years.

9. Decision aid programs were positively correlated with number of group presentations per year, number of inservices attended in the last 2 years, and number of inservices attended in the last 3 to 5 years.

10. Expert systems were positively correlated with the number of inservices attended in the last 2 years and the number of inservices attended in the last 3 to 5 years.

11. Videotapes were positively correlated with major and number of group presentations per year. They were negatively correlated with sex.

12. Information/data base services were positively correlated with the number of inservices attended in the last 2 years and the number of inservices attended in the last 3 to 5 years.

The same statistical procedure was used to determine the relationship between the anticipated use of educational materials and the demographic data. The results are summarized in Table 20. From these analyses, the following correlations were observed:

1. For spreadsheets, there was a positive correlation between it and sex, present position, and number of inservices attended in the last 3 to 5 years. It was slightly negatively correlated to major field of study and number of inservices attended in the last 2 years.

2. For word processing, there was a negative correlation with experience and positive correlation with number of group presentations per year.

3. For data base management programs, there was a positive correlation with number of group presentations per year, number of inservices attended in the last 2 years, and number of inservices attended in the last 3 to 5 years.

4. For telecommunications programs, there was a positive correlation with number of group presentations per year, number of inservices attended in the last 2 years, and number of inservices attended in the last 3 to 5 years.

5. Presentation graphics were positively correlated with number of group presentations per year, number of inservices attended in the last 3 to 5 years, and degree. It was negatively correlated with experience.

6. For tutorial programs, there was a negative correlation with age, present position, experience, and degree. However, there was a positive correlation with number of group presentations per year, number of inservices attended in the last 2 years, and number of inservices attended in the last 3 to 5 years.

7. For drill and practice programs, there was a negative correlation with age, present position, and degree. It was positively correlated with

number of inservices attended in the last 2 years and number of inservices attended in the last 3 to 5 years.

8. Simulation programs were positively correlated with number of inservices attended in the last 2 years and number of inservices attended in the last 3 to 5 years. There was a negative correlation between simulation programs and major field of study.

9. For decision aid programs, there was a positive correlation with number of group presentations per year, number of inservices attended in the last 2 years, and number of inservices attended in the last 3 to 5 years.

10. For expert system, there was a positive correlation with number of group presentations per year, number of inservices attended in the last 2 years, and number of inservices attended in the last 3 to 5 years.

11. For videotapes, there was a negative correlation with present position and degree. There was a positive correlation with number of group presentations per year, number of inservices in the last 2 years, and number of inservices in the last 3 to 5 years.

12. For information and data service, there was a positive correlation with the number of group presentations per year, number of inservices attended in the last 2 years, and number of inservices attended in the last 3 to 5 years.

Hypothesis 7

The seventh hypothesis dealt with the perceptions of Extension personnel about the use of the following classes of educational

technologies: traditional, computers, video, and emerging (satellite uplink/downlink, microwave transmission, fiber-optics, and interactive videodisk). Hypothesis 7 was stated as:

> There is no significant difference in the extent to which Extension personnel at each state currently use and anticipate using the following educational technology equipment: a) traditional, b) computers, c) video, and d) emerging technologies.

$$H07: \mu_{1 \text{ currently use}} = \mu_{1 \text{ anticipate using}}.$$

A paired t-test, by state, was conducted to test for differences in the use of these educational technologies. Table 21 illustrates the results of these t-tests. Significant differences were found between the current use and the anticipated use of educational technologies in most states. For these technologies the null hypothesis was rejected. Significant differences did not occur in the traditional technology for most states.

Hypothesis 8

The eighth hypothesis was to determine the differences in the use of educational technology equipment in Extension program functions. Hypothesis 8 was stated as:

> There is no significant difference in the current and anticipated use of educational technology equipment in administration and planning, group instruction, and individual instruction programs as perceived by Extension personnel.

$$H08: \mu_{\text{currently use}} = \mu_{\text{anticipate using}}.$$

Table 21. Paired t-test analysis of the current and anticipated use of educational technologies by state

States	Current use Mean[a]	Current use S.D.	Anticipated use Mean[a]	Anticipated use S.D.	t-value	t-prob.
Traditional						
Illinois	2.92	.99	3.00	.99	-.90	.37
Indiana	2.84	1.09	2.82	1.09	.15	.88
Iowa	2.70	.94	2.72	.90	-.52	.60
Kansas	2.61	.91	2.72	.94	-2.26	.02*
Michigan	2.84	1.19	2.83	1.15	.18	.85
Minnesota	2.75	1.07	2.69	1.04	.69	.49
Missouri	2.55	.95	2.54	.96	.24	.80
Nebraska	3.20	1.13	3.28	1.18	-.71	.48
North Dakota	2.73	.94	2.64	.82	.74	.46
Ohio	2.88	1.02	2.98	1.09	-2.73	.00**
South Dakota	3.03	1.22	3.05	1.19	-.17	.86
Wisconsin	2.54	.75	2.57	.81	-.36	.72
Computers						
Illinois	2.84	1.06	3.47	1.09	-5.28	.00**
Indiana	2.69	1.13	3.07	1.15	-3.13	.00**
Iowa	2.76	1.04	3.25	1.08	-5.90	.00**
Kansas	2.72	1.10	3.23	1.06	-7.03	.00**
Michigan	2.78	1.06	3.34	1.04	-5.70	.00**
Minnesota	3.14	1.12	3.52	1.18	-3.97	.00**
Missouri	2.43	.94	2.94	1.01	-6.09	.00**
Nebraska	3.00	1.18	3.60	1.21	-4.17	.00**
North Dakota	2.64	.88	3.00	.95	-2.62	.02*
Ohio	2.81	.98	3.26	1.01	-4.88	.00**
South Dakota	2.92	1.16	3.70	.94	-3.53	.00**
Wisconsin	2.77	.93	3.28	.91	-5.71	.00**
Video						
Illinois	2.23	1.16	2.89	1.18	-3.39	.00**
Indiana	2.76	1.15	3.02	1.25	-2.81	.00**
Iowa	2.42	.94	2.88	1.05	-5.32	.00**
Kansas	2.29	.96	2.72	1.04	-6.32	.00**
Michigan	2.35	.96	2.95	1.05	-6.81	.00**
Minnesota	2.45	1.06	2.92	1.29	-4.63	.00**
Missouri	2.10	.66	2.56	.76	-4.74	.00**
Nebraska	2.77	1.15	3.25	1.16	-3.89	.00**

[a]Rated on a 5-point Likert scale with 1 as "None (0 times/month)" and 5 as "Nearly always (>15 times/month)."

*Significant at the .05 level.

**Significant at the .01 level.

Table 21. Continued

States	Current use Mean	S.D.	Anticipated use Mean	S.D.	t-value	t-prob.
North Dakota	2.28	.99	2.57	1.19	-2.58	.02*
Ohio	2.77	1.15	3.25	1.16	-3.89	.00**
South Dakota	2.40	1.15	3.30	1.06	-5.32	.00**
Wisconsin	2.09	.59	2.57	.97	-4.00	.00**
Satellite uplink/downlink						
Illinois	1.27	.60	2.10	1.02	-4.97	.00**
Indiana	1.48	.76	1.99	1.14	-3.57	.00**
Iowa	2.03	.82	2.55	.98	-6.03	.00**
Kansas	1.31	.48	1.89	.85	-6.25	.00**
Michigan	1.24	.42	1.87	.90	-5.81	.00**
Minnesota	1.42	.54	2.29	1.07	-6.49	.00**
Missouri	1.55	.63	2.30	.89	-5.43	.00**
Nebraska	1.80	.70	2.57	1.10	-5.97	.00**
North Dakota	1.42	.46	1.91	.83	-4.19	.00**
Ohio	1.59	.68	2.05	.88	-5.23	.00**
South Dakota	1.28	.37	2.24	.89	-4.86	.00**
Wisconsin	1.78	.78	2.42	1.02	-4.83	.00**
Microwave transmission						
Illinois	1.72	1.00	1.06	.22	3.73	.00**
Indiana	1.75	1.07	1.37	.86	3.28	.00**
Iowa	1.60	.93	1.19	.66	3.52	.00**
Kansas	1.46	.76	1.10	.37	3.93	.00**
Michigan	1.53	.74	1.08	.37	3.99	.00**
Minnesota	1.62	.82	1.08	.27	4.77	.00**
Missouri	1.45	.72	1.16	.41	2.85	.00**
Nebraska	1.62	.86	1.29	.60	2.82	.00**
North Dakota	1.64	.91	1.23	.40	2.65	.02*
Ohio	1.27	.68	1.09	.29	1.79	.08
South Dakota	1.80	.96	1.03	.16	3.58	.00**
Wisconsin	1.61	.87	1.33	.75	2.06	.04*
Fiber-optics						
Illinois	1.27	.74	2.00	1.21	-3.98	.00**
Indiana	1.23	.74	1.68	1.08	-3.64	.00**
Iowa	1.15	.66	1.80	1.08	-4.90	.00**
Kansas	1.23	.65	1.61	.88	-3.69	.00**
Michigan	1.11	.41	1.86	1.00	-4.67	.00**
Minnesota	1.14	.42	1.77	.94	-14.98	.00**
Missouri	1.11	.27	1.52	.75	-3.30	.00**
Nebraska	1.23	.55	1.69	.97	-3.02	.00**
North Dakota	1.44	.37	2.20	.99	-3.61	.00**

Table 21. Continued

States	Current use Mean	Current use S.D.	Anticipated use Mean	Anticipated use S.D.	t-value	t-prob.
Ohio	1.14	.48	1.36	.78	-2.06	.04*
South Dakota	1.01	.08	1.78	.92	-3.58	.00**
Wisconsin	1.23	.64	1.64	.92	-3.68	.00**
Interactive videodisk						
Illinois	1.05	.21	1.98	1.10	-4.67	.00**
Indiana	1.05	.23	1.72	.97	-4.64	.00**
Iowa	1.05	.19	1.74	.97	-4.99	.00**
Kansas	1.21	.63	1.58	.82	-3.14	.00**
Michigan	1.09	.29	1.64	.74	-4.55	.00**
Minnesota	1.13	.34	1.81	.92	-5.78	.00**
Missouri	1.08	.23	1.67	.81	-4.70	.00**
Nebraska	1.21	.53	1.80	.92	-4.67	.00**
North Dakota	1.21	.36	1.69	1.09	-2.11	.05
Ohio	1.10	.35	1.37	.69	-2.79	.00**
South Dakota	1.07	.24	1.74	.82	-3.86	.00**
Wisconsin	1.19	.54	1.69	.93	-4.40	.00**

A paired t-test was performed to determine significant differences in the current and anticipated use of the following educational technology equipment: traditional, computers, video, and emerging. The latter includes satellite up/downlink, microwave transmission, fiber-optics, and interactive videodisk. Data from Table 22 show that significant differences were found in the current use and anticipated use of nearly all educational technology equipment. The only exception to this conclusion was with the traditional technology. The null hypothesis was rejected for the other technologies at the .05 level of significance.

In other words, there is a significant difference in the current and anticipated use of educational technology equipment in administration and planning, group instruction, and individual instruction programs as perceived by Extension personnel.

Table 22. Paired t-test analysis of the current and anticipated use of educational technologies

Technology	Current use Mean[a]	Current use S.D.	Anticipated use Mean[a]	Anticipated use S.D.	t-value	t-prob.
Traditional	2.78	1.02	2.81	1.02	-1.29	.19
Computers	2.80	1.05	3.30	1.07	-16.57	.00**
Video	2.37	.97	2.84	1.09	-15.12	.00**
Satellite up/ downlink	1.53	.67	2.18	.99	-17.91	.00**
Microwave transmission	1.56	.85	1.16	.50	11.11	.00**
Fiber-optics	1.18	.55	1.70	.96	-12.91	.00**
Interactive videodisk	1.12	.38	1.68	.89	-14.29	.00**

[a]Rated on a 5-point Likert scale with 1 as "None (0 times/month)" and 5 as "Nearly always (>15 times/month)."

**Significant at the .05 level.

Hypothesis 9

The last hypothesis dealt with the relationship between the current use and anticipated use of educational technology tools in three major Extension programming functions and selected demographic variables. Hypothesis 9 was stated as:

> There is no relationship between the extent to which Extension personnel currently use and anticipate using educational technology equipment and the following demographic variables:
>
> a. Extension personnel's age
> b. Extension personnel's sex
> c. Extension personnel's present position
> d. Extension personnel's number of group presentations per year
> e. Extension personnel's number of inservices attended in last 2 years
> f. Extension personnel's number of inservices attended in last 3 to 5 years
> g. Extension personnel's years of experience
> h. Extension personnel's major
> i. Extension personnel's education (highest degree held).

Pearson product moment correlations were used to test this hypothesis. The means and standard deviations are reported in Table 23. Tables 24, 25, and 26 show the results of these correlations.

Three major functions of Extension programming were considered in this analysis. Administration and planning, as function, included all activities related to the administration of a professional Extension staff member's program and the necessary planning to implement that program. Group instruction included such activities as meetings, seminars, short courses, etc. Individual instruction was defined as one-to-one education such as office callers, client contacts, visitors, site visits, clientele counseling, etc. Table 24 shows the correlation results between the

Table 23. Means and standard deviations for the current use and expected use of ETt by Extension programming function

ETt	Current use Mean[a]	Current use S.D.	Anticipated use Mean[a]	Anticipated use S.D.
Administration and planning	2.90	1.33	2.90	1.33
Traditional	2.90	1.33	2.86	1.31
Computer	3.48	1.36	3.86	1.25
Video	2.47	1.19	2.83	1.24
Satellite up/downlink	1.64	.87	2.31	1.14
Microwave transmission	1.13	.55	1.62	.98
Fiber-optics	1.18	.65	1.77	1.10
Interactive videodisk	1.11	.47	1.71	.98
Group instruction				
Traditional	3.36	1.21	3.31	1.20
Computer	2.59	1.34	3.04	1.33
Video	2.69	1.15	3.09	1.20
Satellite up/downlink	1.69	.92	2.48	1.17
Microwave transmission	1.20	.65	1.65	1.00
Fiber-optics	1.22	.70	1.76	1.09
Interactive videodisk	1.18	.62	1.74	1.01
Individual instruction				
Traditional	2.23	1.31	2.25	1.30
Computer	2.52	1.26	3.01	1.29
Video	3.18	1.14	2.64	1.26
Satellite up/downlink	1.27	.62	1.67	.98
Microwave transmission	1.09	.38	1.44	.84
Fiber-optics	1.11	.46	1.55	.97
Interactive videodisk	1.07	.29	1.58	.99

[a]Rated on a 5-point Likert scale with 1 as "None (0 times/month" and 5 as "Nearly always (>15 times/month)."

Table 24. Correlation between the current use and anticipated use of ETt and selected demographic variables in the administration and planning of Extension programs

ETt	X1[a]	X2[b]	X3[c]	X4[d]	X5[e]	X6[f]	X7[g]	X8[h]	X9[i]
Current use									
Traditional	.13**	.00	-.03	.14**	.07	.04	.10*	-.03	.13**
Computers	-.03	-.11*	-.02	.02	.07	.10*	-.07	.05	.06
Video	.03	-.07	-.10*	.15*	.10*	.05	.02	.06	-.06
Satellite up/downlink	.12**	-.09**	-.01	.11	.02	.12**	.11*	.08	.08
Microwave transmissions	.08	.07	.08	.05	.07	.07	.07	.01	.03
Fiber-optics	.05	.08	-.00	.02	.11*	.06	.05	-.04	.02
Interactive videodisk	.11*	.08	.01	.13**	.09	.06	.08	-.08	.02
Anticipated use									
Traditional	.08	.02	-.07	.14**	.06	.05	.05	-.04	.09
Computers	-.10	-.16**	-.08	.06	.09	.12**	-.10*	.04	.02
Video	.00	-.08	-.16**	.15**	.13**	.11*	-.00	.07	-.08
Satellite up/downlink	.05	-.11*	-.10*	.13**	.08	.14**	.06	.11*	.06
Microwave transmissions	.03	-.09*	-.04	.18**	.11*	.11*	.05	.04	.00
Fiber-optics	.06	-.04	-.06	.12**	.17**	.18**	.08	.02	.02
Interactive videodisk	.13**	-.06	-.08	.15**	.18**	.18**	.14**	.04	.01

[a]X1=age.
[b]X2=sex.
[c]X3=present position.
[d]X4=number of group presentations per year.
[e]X5=number of inservices attended in last 2 years.
[f]X6=number of inservices attended in last 3 to 5 years.
[g]X7=years of experience.
[h]X8=major.
[i]X9=degree.
*Significant at the .05 level.
**Significant at the .01 level.

current and anticipated use of ETt and selected demographic variables in the administration and planning of Extension programs. Many low to non-existent correlations were found between the anticipated use of ETt and the number of inservices attended in the last 2 years. Likewise, positive correlations were found between the anticipated use of ETt and the number of inservices attended in the last 3 to 5 years. Therefore, the null hypothesis was accepted. Significant correlations were found in several cases and are reported as follows:

1. For the current use of traditional ETt, there was a positive correlation between it and age, experience, degree, and group presentations. A positive correlation was also found between the anticipated use and the number of group presentations.

2. For the current use of computers, there was a correlation with sex. For the anticipated use of computers, a negative correlation was found between the expected use and experience. A positive correlation was found for the number of inservices attended in the last 3 to 5 years.

3. A negative correlation was found between the current and expected use of video educational technologies and the present position of the Extension professionals. Also, a positive correlation was found between this technology and group presentations.

4. For the current use of satellite uplink/downlink, there was a positive correlation between it and age, group presentations, and inservices attended in the last 3 to 5 years. Also, there was a negative correlation between the anticipated use and position of the Extension professionals. A positive correlation was found between the anticipated

use and major, group presentations, and inservices attended in the last 3 to 5 years.

5. There was a positive correlation between the current use and anticipated use of fiber-optics and the number of inservices attended in the last 2 years.

6. There was a positive correlation between the current use and anticipated use of the interactive videodisk and the age and group presentations of the respondents. A positive correlation was found between the anticipated use of the interactive videodisk and the years of experience and number of inservices attended in the last 3 to 5 years.

Table 25 shows the results of the correlation for the current use and anticipated use of educational technologies when using group instruction. Low to non-existent correlations were found between the anticipated use of all ETt, except for the traditional technology, and the number of inservices attended in the last 2 and 3 to 5 years by Extension personnel. The strongest relationships were found in the fiber-optics and interactive video-disk technologies. Other significant correlations were found and are reported as follows:

1. There was a negative correlation between the use of computers and the major field of study for both the current use and anticipated use. A positive correlation was found between the anticipated use of computers and group presentations and number of inservices attended in the last 3 to 5 years.

2. For the current use of video technology, there was a negative correlation between it and present position and degree. The same was true

Table 25. Correlation between the current use and anticipated use of ETt and selected demographic variables in the group instruction and delivery of Extension programs

ETt	X1[a]	X2[b]	X3[c]	X4[d]	X5[e]	X6[f]	X7[g]	X8[h]	X9[i]
Current use									
Traditional	.07	-.00	.02	.10*	.03	.00	.03	-.06	.07
Computers	.01	-.04	-.04	.11*	.07	.08*	-.00	-.08*	-.03
Video	.03	-.13**	-.09*	.19**	.09*	.10*	.06	.08	-.13**
Satellite up/downlink	.09*	-.08	.01	.14**	.08	.14**	.05	.08	.06
Microwave transmissions	.09	.02	.06	.08	.14**	.11*	.10*	.04	.04
Fiber-optics	.06	.03	.04	.07	.14**	.09	.04	-.00	.06
Interactive videodisk	.12**	.02	.02	.12**	.11*	.06	.10*	.01	.06
Anticipated use									
Traditional	.02	.03	.03	.12**	.04	.03	-.01	-.04	.05
Computers	-.04	-.03	-.08	.12*	.13**	.12**	-.03	-.12**	-.07
Video	-.00	-.17**	-.08	.19**	.14**	.12**	.01	.07	-.16**
Satellite up/downlink	-.00	-.11*	-.07	.15**	.11*	.15**	.03	.11*	.04
Microwave transmissions	.04	-.02	-.02	.20**	.16**	.14**	.08	.03	.01
Fiber-optics	.04	.00	-.03	.15**	.20**	.17**	.09	.03	-.00
Interactive videodisk	.02	-.03	-.08	.13**	.20**	.17**	.09	.02	.02

[a]X1=age.
[b]X2=sex.
[c]X3=present position.
[d]X4=number of group presentations per year.
[e]X5=number of inservices attended in last 2 years.
[f]X6=number of inservices attended in last 3 to 5 years.
[g]X7=years of experience.
[h]X8=major.
[i]X9=degree.
*Significant at the .05 level.
**Significant at the .01 level.

for the anticipated use of video. There was a positive correlation between the current use of and expected use of video technology and group presentations by year, and number of inservices attended in the last 2 and 3 to 5 years.

3. For satellite uplink/downlink technologies, there was a positive correlation with the current use of this technology and the age of the respondents, number of group presentations per year, and number of inservices attended in the last 3 to 5 years.

4. A positive correlation was found between the current use of microwave transmissions and the experience of the Extension professionals. Also, there was a positive correlation between the anticipated use of microwave transmissions and group presentations and the number of inservices attended in the last 3 to 5 years.

5. A positive correlation was found between the current use of fiber-optics and the number of inservices attended in the last 2 years. Also, positive correlations were found between the anticipated use of this technology, group presentations, and the number of inservices attended.

6. A positive correlation was found between the current use of interactive videodisk and the years of experience of the respondent. Also, there was a positive correlation between the anticipated use of interactive videodisk and group presentations and the number of inservices attended in the last 2 and 3 to 5 years.

Table 26 shows the correlation between the current use and anticipated use of ETt in individualized instruction and the various demographic variables. The significant correlations most often showed

Table 26. Correlation between the current use and anticipated use of ETt and selected demographic variables in individualized instruction of Extension programs

ETt	X1[a]	X2[b]	X3[c]	X4[d]	X5[e]	X6[f]	X7[g]	X8[h]	X9[i]
Current use									
Traditional	.10*	.04	-.01	.00	.13**	.08	.10*	-.05	.02
Computer	-.03	.06	.00	.01	.09*	.10*	.00	-.07	-.02
Video	-.03	-.07	-.07	.08	.12**	.11*	.01	.00	-.17**
Satellite up/downlink	.00	-.02	-.00	.07	.13**	.10*	.00	.05	-.03
Microwave transmissions	.04	.06	.07	.04	.03	.03	.04	-.04	.05
Fiber-optics	.03	.05	-.03	-.02	.12**	.09*	.04	-.00	-.00
Interactive videodisk	.11*	.04	.00	.04	.14**	.08	.01	-.02	.04
Anticipated use									
Traditional	.04	.06	-.02	.04	.15**	.10*	.04	-.05	-.05
Computers	-.13**	-.00	-.05	.04	.18**	.18**	-.04	-.05	-.11*
Video	-.10	-.07	-.12	.07	.17**	.18**	-.03	.04	-.16**
Satellite up/downlink	-.07	-.09	-.05	.11*	.18**	.15**	.00	.08	-.05
Microwave transmissions	-.03	-.07	-.07	.13**	.14**	.18**	.02	.03	-.06
Fiber-optics	-.02	-.04	-.12*	.14**	.16**	.19**	.03	.04	-.03
Interactive videodisk	-.00	.00	-.05	.01	.13**	.17**	.01	-.00	-.01

[a]X1=age.
[b]X2=sex.
[c]X3=present position.
[d]X4=number of group presentations per year.
[e]X5=number of inservices attended in last 2 years.
[f]X6=number of inservices attended in last 3 to 5 years.
[g]X7=years of experience.
[h]X8=major.
[i]X9=degree.
*Significant at the .05 level.
**Significant at the .01 level.

little if any relationships. Although these relationships were weak, they suggest that the number of inservices attended in the last 2 and 3 to 5 years may increase the anticipated use of all ETt. The same conclusion may be true for the current use of most ETt. Fewer significant correlations were found and are reported as follows:

1. Positive correlations were found between the current use of traditional ETt and age, years of experience, and number of inservices attended in the last 2 years. A positive correlation was found between the anticipated use of it and the number of inservices attended.

2. Negative correlations were found between the anticipated use of computers and the age and degree of the respondent.

3. Negative correlations were found between the current use of and anticipated use of video technology and degree.

4. Positive correlations were found between the anticipated use of satellite up/downlink and the number of group presentations per year and the number of inservices attended.

5. Positive correlations were found between the anticipated use of microwave transmissions and the number of group presentations per year and the number of inservices attended.

6. A negative correlation was found between the anticipated use of fiber-optic technology and current position. A positive correlation was found between the anticipated use of fiber-optics and the number of inservices attended the last 2 and 3 to 5 years.

Summary

This study was undertaken for the purpose of investigating the current use and anticipated use of ETt by Extension professionals in the North Central Region and to assess barriers which may impede the use of these technologies. A mailed survey was used and 530 responses were included in the study. This section summarizes some of the major findings.

Some of the major findings relative to the demographics of the sample were as follows:

1. The age of the Extension professionals was nearly evenly distributed among these categories; namely, 26-39 years old, 40-49 years old, and 50 years and older category.

2. The sample was approximately two-thirds male and one-third female.

3. The highest percentage of the sample held a combination of positions in their present job (agriculture, home economics, 4-H and youth, or administrative).

4. Related to the B.S. degree major field of study, approximately 50% held a degree in agriculture.

5. Over 50% of the respondents had a M.S. degree, while less than 20% had a B.S. degree only.

6. The years of Extension experience was nearly divided into three groups; namely, 10 years or less, 11 to 20 years, and more than 20 years of Extension experience.

7. In relation to the number of group presentations per year by the Extension professionals, approximately 40% of the sample made 20 or fewer presentations per year, while slightly more than 30% made more than 40 presentations per year.

8. Forty percent had attended between one and two training sessions on educational technologies during the last 2 years, while slightly more than half had attended between one and five inservice training sessions in the last 3 to 5 years.

9. Nearly every respondent had access to an overhead projector, a slide projector, and a microcomputer.

Respondents were asked to rate on a Likert-type scale eight barriers that may have inhibited their use of traditional, computer, video, and emerging educational technologies. Some of the major findings relative to these barriers are listed as follows:

1. There is no single barrier that limits the use of traditional technologies such as an overhead projector or carousel slide projector.

2. The "lack of time" was identified as the most limiting barrier with respect to computer technology. It was followed by the lack of funds and lack of experience.

3. With respect to the use of the video technologies, the lack of funds and time were the most limiting barriers.

4. For the emerging technologies (satellite uplink/downlink, microwave transmissions, fiber-optics, and interactive videodisk), the lack of funds, lack of experience, and the lack of training were the most

limiting of the barriers. All were at least moderately limiting the use of these technologies.

The Extension professionals were asked to rate on a Likert-type scale (1 to 5) their current use of the seven ETt and their anticipated use in the next 2 years of these technologies. Some of the major findings are as follows:

1. Only a slight increase is expected in the use of the traditional technology (2.78 vs. 2.81). This increase was not significant (alpha=.05).

2. Significant differences were found between the current use and anticipated use for the remaining six technologies, which were: computers, video, satellite up/downlink, microwave transmissions, fiber-optics, and interactive video-disk.

3. The data would indicate that the Extension professionals anticipate increasing the use of the emerging technologies more than computer or video equipment. That is, there was a larger difference in the rate of increase for those technologies (50% for interactive video-disk) as compared to the computer (17%) and video technologies (19%).

The Extension professionals were asked to rate on a Likert-type scale (1 to 5) their current use and anticipated use of various types of software and hardware used to support educational technology tools. Those pieces of hardware and software identified were as follows: spreadsheets, word processing, data base management, telecommunications, presentation graphics, tutorial programs, drill/practice programs, simulation programs, decision aid programs, expert systems, videotapes, and information/data

base services. For statistical analyses, the hardware and software programs were combined into three major categories; namely, traditional programs (spreadsheets, word processing, data base management, and telecommunications); teaching aid programs (presentation graphics, tutorial programs, drill/practice programs, simulation programs, decision aid programs, and expert systems); and other programs (videotapes and information/data base services). Some of the major findings of the current and anticipated use of these technologies and hardware and software are as follows:

1. Extension professionals expect to increase their usage of all three classifications of hardware and software. Respondents using the rating scale indicate that all Extension professionals expect their usage to increase 1-5 to 6-10 times per month for the traditional forms of hardware/software and for other forms including videotapes and information/data base services. A lesser increase was indicated for teaching aids.

2. There were significant differences between the current use and anticipated use of these forms of hardware and software.

3. When the data were grouped by states, there were no significant differences in the current use and anticipated use of these forms of hardware and software.

Several objectives were identified as part of this study. To test these objectives, nine different hypotheses were formulated. The results of the hypothesis testing are described as follows:

1. Hypothesis 1 was to determine if there were no significant differences in the barriers which may have prevented Extension personnel from utilizing educational technologies. Analysis of variance was used to determine whether the seven technologies' means differed significantly among the different barriers. The differences were significant at the .01 level. Therefore, the null hypothesis was rejected.

2. Hypothesis 2 dealt with the differences in the barriers which may have prevented Extension personnel from utilizing educational technologies when the data were grouped by state. The analysis of variance showed significant differences for satellite uplink/downlink and microwave transmission technologies, respectively, and the null hypothesis was rejected.

3. Hypothesis 3 dealt with the relationship between the barriers and the various demographic variables. In general, there was little or no correlation between the barriers and some of the demographic variables. Therefore, the null hypothesis failed to be rejected.

4. Hypothesis 4 dealt with the current and anticipated use of three forms of hardware/software. Paired t-tests were used to test the differences. Significant differences were found and the null hypothesis was rejected.

5. Hypothesis 5 was formulated to determine if Extension personnel had similar perceptions related to the current use and anticipated use of three forms of hardware/software when the data were grouped by state. No significant differences were found, and the null hypothesis was accepted.

6. Hypothesis 6 dealt with the relationship between the current use and anticipated use of 12 specific types of hardware/software with the various demographic variables. Pearson correlation coefficients were used to test this hypothesis. Most of the correlation coefficients showed little or no correlation. Therefore, the null hypothesis failed to be rejected. The highest correlations were found in the number of inservices attended in the last 2 years or the number of inservices attended in the last 3 to 5 years.

7. Hypothesis 7 dealt with the perceptions of Extension personnel about the use of the following classes of educational technology tools: traditional, computers, video, and emerging. A paired t-test, by state, was used to test these differences. Significant differences were found between the current use and anticipated use in most cases. Therefore, the null hypothesis was rejected.

8. Hypothesis 8 tested the differences in the use of the educational technology tools for three major Extension programming functions. A paired t-test was performed to measure these differences. Significant differences were found in the current and anticipated use for all educational technology tools except for the traditional tools. Therefore, the null hypothesis was rejected in all cases except for the traditional tools.

9. Hypothesis 9 dealt with the relationship between the use of educational technology tools in three Extension programming functions and the various demographic variables. Pearson correlation coefficients were used to test this hypothesis. Most of the correlation coefficients showed

little or no correlation. Therefore, the hypothesis failed to be rejected. Although these relationships were low to non-existent, they suggest that the number of inservices attended in the last 2 and 3 to 5 years will increase the use of the most educational technology tools.

CHAPTER V. CONCLUSIONS AND RECOMMENDATIONS

This research project and study focused on the use of educational technology tools (ETt) within the Extension Service and its professional staff including administrators, state and area specialists, and county-based staff in the North Central Region of the United States. ETt are those pieces of equipment, software, and hardware used by the professional staff to support program delivery and management.

Conclusions

This chapter describes some of the conclusions based upon the research and recommendations to the Extension Service and others. Listed below are some of the major conclusions based upon the research.

1. More than two-thirds of Extension professionals had attended one or more inservices on educational technology during the last 2 years. Also, more than two-thirds of them had attended one or more inservices during the last 3 to 5 years. Therefore, most of the respondents should be aware of the potential use of educational technology tools in education.

2. Traditional and computer technologies were the most common equipment available to Extension personnel. These technologies were available to over 90% of the respondents. Satellite downlinks were available for 46.6% of the respondents. Therefore, nearly all Extension professionals have access to the necessary traditional and computer technology tools to carry out their programs. However, the majority of

the same staff members do not have the same access to emerging educational tools such as microwave transmissions, fiber-optics, and interactive videodisk.

3. A factor analysis of the questionnaire statements regarding the perceptions of the respondents toward the use of these tools to enhance Extension education failed to explain the relationships. This suggests that other statements need to be identified to statistically explain these differences.

4. Traditional technology tools such as the overhead projector and carousel projector are widely used in Extension and their use is not limited by any barriers.

5. Computer technology is rapidly becoming a traditional technology in Extension. This study suggests that adequate funds have been made available for computer technology. Also, adequate training has been provided. Only the "lack of time" is inhibiting the greater use of this technology. The same can be said for the video technologies.

6. Most of the Extension staff are aware of the emerging technologies such as the satellite uplink/downlink, microwave transmissions, fiber-optics, and interactive videodisk. However, most of the emerging technologies are not widely used in Extension because of the "lack of funds." This could be interpreted as the lack of funds to purchase the capital equipment or the lack of funds to cover the variable costs through access charges, etc. Also, it can be concluded that most Extension staff members have not had the necessary experience or training to use these tools.

7. When software/hardware programs were grouped into the three categories of traditional, teaching aids, and video, there were significant differences between the current use and anticipated use. It also can be concluded from the data that there may be a slight reduction in the use of traditional software/hardware programs in the next 2 years. This would suggest some substitution of the traditional forms by the newer emerging forms of software/hardware.

8. Word processing is the most popular computer software program currently being used by Extension professionals (6 to 15 times per month). The use of word processing is expected to increase in the next 2 years. Other popular forms of software/hardware being used are telecommunications programs, videotapes, and data base management programs. Presently, they are used from one to ten times per month.

9. No strong relationships were found in the study. The highest relationships found in this study were those that exist between Extension personnel's sex and major and the current use and anticipated use of spreadsheets. Although these relationships were weak ($r=.30$), their direction suggests that people who held a non-agriculture major used spreadsheets less than did Extension personnel who held an agriculture major. Also, the correlation with sex could mean that male Extension professionals tend to use spreadsheets more frequently than do female Extension staff.

10. All the educational materials and software, except the current use of spreadsheets and word processing, were positively correlated with either number of group presentations per year or the number of inservices

attended in the last 2, or 3 to 5 years. Although these correlations were weak, their direction suggests that as the number of group presentations (current and anticipated) and inservices increase, the use of these technologies also tend to increase. It is clear that there are a variety of teaching tools available to Extension personnel where each tool satisfies a different need. As time becomes limited, Extension staff try to improve their efficiency in the use of ETt. Also, it is clear that inservices in ETt are helping Extension staff improve their presentations.

11. The data indicate that there are significant differences among the barriers which may prevent Extension personnel across the North Central Region from utilizing the following technologies: a) traditional, b) computers, c) video, d) emerging satellite uplink/downlink, e) microwave transmissions, f) fiber-optics, and g) interactive videodisk. The lack of funds was identified as the most limiting barrier for all emerging educational technology tools and for video technology tools. Ample resources are available for traditional tools and computers, but they are most limiting by the lack of time available to Extension professionals.

12. There are significant differences in the barriers which may have prevented Extension personnel from utilizing satellite uplink/downlink and microwave transmission technologies when the data were grouped by state. Therefore, it can be concluded that the barriers are not uniform in impeding the use of ETt in Extension among the states.

13. There were no strong positive or negative correlations among the demographic variables, the barriers, and the use of the educational

technologies. However, some of the more practical conclusions that can be drawn from these are as follows:

a. The negative correlation between age and lack of funds suggests that older staff or limited budgets would use the computer less than others.

b. The negative correlation between video technologies and the number of group presentations and the lack of experience is interesting. This suggests that as the number of group presentations increase, Extension professionals tend to use a greater variety of educational technologies.

c. The low negative correlation for the emerging technologies between the lack of experience and the number of inservices attended in the last 2 years would suggest that these technologies would be more widely used if additional training was offered.

14. In general, the educational technology equipment used in administration and planning, group instruction, and individual instruction Extension program functions are weakly related to group presentations by year and the number of inservices attended on educational technologies in the last 2 years. Likewise, the same technology equipment is weakly related to the number of inservices attended in the last 3 to 5 years. Notwithstanding that these correlations were weak, they suggest that as the number of group presentations increase (current and anticipated) and the number of inservices increase, the use of these technologies in Extension activities may also increase.

Recommendations

Based on the findings and conclusions drawn from this study, the following recommendations are made:

1. The results of this study should be shared with the Extension Service administration in each state. Administrators play a key role as each institution makes plans for its future activities.

2. Data indicate that the "lack of training and experience" and "unaware of the technology" are significant barriers in the use of most instructional technologies. Therefore, implementation of educational programs that can be focused in the use of these technologies is an important task.

3. It is important that administration provides support for the use of educational technologies.

4. Given the potential use of ETt, Extension personnel should use more of these educational technologies in their program delivery.

5. Data indicate that emerging technologies are not readily available to Extension personnel. The lack of funds was identified as the most limiting barrier for this kind of technology. The access to emerging technologies would provide to Extension personnel innovative equipment for expanding their teaching methods.

6. Data show that tutorial programs, drill/practice programs, and expert systems were seldom used by Extension personnel. It is recommended that educational programs be offered in order to increase awareness about their potential.

7. Since the perceptions of educational technologies and the impeding barriers are similar for each state, except for satellite uplink/downlink and microwave transmissions, similar educational training programs could be designed and implemented in all states within the North Central Region.

8. Many state Extension services have administrative and support staff to prepare Extension professionals to use computers. This study would suggest that computers are now considered to be a traditional technology. It is recommended that administrators review how these resources are being used and perhaps be redirected to education related to emerging technologies.

9. Program delivery in Extension is a key factor in the success of Extension programs. As financial resources become more constrained in Extension, administrators and professionals should consider using more emerging educational technology tools. This study would indicate that staff are aware of these tools but are in the need of additional training, time, and experience.

Recommendations for Further Research

1. A similar study should be carried out on the national level and the results compared with the findings of this study.

2. It is recommended that in future studies, definitions of key terms be included in the questionnaire.

3. It is recommended that special attention be given to Section III of the questionnaire. Very clear instructions on agreement/disagreement

to educational technology hardware and software used for the enhancement of education need to be formulated.

4. Different barriers such as outdated technology, lack of software materials, and outdated support materials should be included in future studies. It is important also that additional educational technologies such as audio, hypermedia, and print technology be investigated.

5. A similar study should be conducted on the use of ETt in undergraduate teaching programs at land-grand universities in the North Central Region or on the national level.

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APPENDIX A.

T-TEST RESULTS BETWEEN RESPONDENTS AND NON-RESPONDENTS

Table A.1. Differences between responding and non-responding Extension staff when comparing selected statements about educational technology (ET) (Section III)

Variables	Respondents N	Respondents Mean[a]	Respondents S.D.	Non-respondents N	Non-respondents Mean[a]	Non-respondents S.D.	t-value	Prob.
I am willing to learn to use new ET.	526	4.50	.69	18	4.50	.98	0.01	0.991
I would like to see more ET available for use in Extension.	526	4.28	.83	18	4.16	.98	0.59	0.556
Administration should provide more accessibility to new ET.	524	3.93	.82	18	3.94	1.05	-.07	0.948
ET for use out of the office should be stressed.	526	3.92	.78	17	3.58	1.00	1.75	0.810
Administration should provide adequate time to learn the use of ET.	525	4.11	.72	18	4.33	.97	-1.2	0.223
Administration should provide adequate resources necessary to adopt new ET.	525	4.27	.71	17	4.47	.71	-1.13	0.255
Extension staff members should be exposed to ET during their instruction training.	525	4.20	.80	18	4.27	.89	-0.40	0.682
New ET would contribute to a more efficient use of my time.	523	3.82	.92	17	3.94	.74	-0.52	0.600
The use of ET has the potential to help me in my work.	522	4.18	.67	18	4.33	.59	-0.92	0.364

[a]Rated on a 5-point Likert scale with 1 as "Strongly disagree" and 5 as "Strongly agree."

Table A.2. Differences between responding and non-responding Extension staff when comparing ET barriers (Section IV)

Barriers	Respondents N	Respondents Mean[a]	Respondents S.D.	Non-respondents N	Non-respondents Mean[a]	Non-respondents S.D.	t-value	Prob.
Traditional								
Lack of funds	501	1.39	.76	17	1.35	0.86	0.20	0.840
Lack of experience	499	1.18	.49	14	1.21	0.14	-0.24	0.812
Conflict with other job responsibilities	492	1.35	.75	14	1.50	1.09	0.68	0.496
Lack of time	498	1.55	.90	16	1.75	1.23	-0.83	0.404
Unaware of the technology	488	1.10	.45	14	1.07	0.26	0.31	0.759
No interest in the equipment	492	1.17	.57	15	1.20	0.56	-0.14	0.889
Lack of administrative support	489	1.13	.48	14	1.42	0.75	-0.42	0.177
Lack of training	493	1.21	.57	14	1.35	0.74	-0.90	0.370
Computer								
Lack of funds	500	2.49	1.17	15	2.53	1.00	-0.12	0.903
Lack of experience	502	2.41	1.09	16	2.56	1.09	-0.53	0.600
Conflict with other job responsibilities	493	2.07	1.12	15	2.06	1.33	0.01	0.988
Lack of time	498	2.60	1.15	16	2.43	1.20	0.58	0.560
Unaware of the technology	490	1.66	.93	15	1.40	0.82	1.09	0.275
No interest in the equipment	491	1.40	.85	16	1.12	0.50	1.32	0.188
Lack of administrative support	487	1.69	1.02	15	1.86	1.06	-0.63	0.526
Lack of training	496	2.32	1.17	15	2.46	1.24	-0.50	0.619
Satellite up/downlink								
Lack of funds	459	3.29	1.37	10	3.40	1.57	-0.23	0.814
Lack of experience	466	3.02	1.29	11	3.54	1.03	-1.33	0.183
Conflict with other job responsibilities	441	2.32	1.25	11	2.63	1.50	-0.80	0.425

[a]Rated on a 6-point Likert scale with 1 as "This barrier is not limiting in the use of this technology and 6 as "Do not know."

Table A.2. Continued

Barriers	Respondents N	Mean	S.D.	Non-respondents N	Mean	S.D.	t-value	Prob.
Lack of time	455	2.65	1.24	12	2.75	1.21	-0.26	0.798
Unaware of the technology	455	2.15	1.35	11	2.27	1.34	-0.29	0.770
No interest in the equipment	457	1.85	1.18	12	1.58	0.90	0.79	0.428
Lack of administrative support	438	2.11	1.27	11	2.27	1.27	-0.41	0.683
Lack of training	459	2.87	1.32	12	3.33	1.23	-1.19	0.236
Microwave transmissions								
Lack of funds	358	3.98	1.10	9	3.77	1.30	0.56	0.579
Lack of experience	377	3.83	1.16	11	3.90	0.54	-0.22	0.823
Conflict with other job responsibilities	346	2.58	1.37	9	2.55	1.66	0.07	0.942
Lack of time	354	2.91	1.33	10	2.90	1.28	0.03	0.977
Unaware of the technology	378	3.25	1.43	13	3.53	1.39	-0.71	0.479
No interest in the equipment	370	2.31	1.40	11	1.90	1.13	0.94	0.346
Lack of administrative support	319	2.82	1.40	9	2.66	1.11	0.33	0.744
Lack of training	367	3.73	1.25	12	4.08	0.79	-0.97	0.333
Fiber-optics								
Lack of funds	362	4.01	1.18	11	3.81	0.92	0.55	0.582
Lack of experience	382	3.71	1.22	11	3.90	0.70	-0.51	0.611
Conflict with other job responsibilities	350	2.56	1.35	9	2.55	1.66	0.00	0.992
Lack of time	360	2.86	1.31	10	2.90	1.28	-0.09	0.932
Unaware of the technology	381	3.16	1.44	12	3.16	1.46	-0.02	0.988
No interest in the equipment	372	2.17	1.37	11	1.63	0.92	1.29	0.198
Lack of administrative support	327	2.76	1.43	10	2.60	1.07	0.35	0.725
Lack of training	367	3.66	1.31	11	4.00	0.77	-0.85	0.396

Table A.2. Continued

Barriers	Respondents N	Respondents Mean	Respondents S.D.	Non-respondents N	Non-respondents Mean	Non-respondents S.D.	t-value	Prob.
			Interactive videodisk					
Lack of funds	378	4.06	1.02	12	4.08	0.66	-0.05	0.961
Lack of experience	398	3.66	1.17	12	3.66	1.07	-0.02	0.986
Conflict with other job responsibilities	370	2.59	1.34	11	2.45	1.57	0.34	0.736
Lack of time	383	2.90	1.30	12	2.83	1.19	0.18	0.854
Unaware of the technology	402	3.04	1.46	13	2.92	1.55	0.30	0.764
No interest in the equipment	391	2.19	1.36	12	1.58	0.79	1.55	0.123
Lack of administrative support	351	2.81	1.36	11	2.63	1.20	0.42	0.673
Lack of training	394	3.60	1.28	13	3.61	1.19	-0.03	0.975

Table A.3. Differences between responding and non-responding Extension staff when comparing the use of ET in administration and planning (Section VI)

Barriers	Respondents N	Respondents Mean[a]	Respondents S.D.	Non-respondents N	Non-respondents Mean[a]	Non-respondents S.D.	t-value	Prob.
			Current use					
Traditional	492	2.90	1.33	15	2.86	1.35	0.11	0.909
Computers	496	3.48	1.36	15	3.33	1.29	0.43	0.670
Video	487	2.47	1.19	15	2.00	0.92	1.52	0.130
Satellite up/downlink	474	1.64	0.87	15	1.53	0.83	0.49	0.623
Microwave transmission	451	1.13	0.55	15	1.00	0.00	0.98	0.326
Fiber-optics	455	1.18	0.65	15	1.20	0.56	-0.09	0.929
Interactive videodisk	454	1.11	0.47	15	1.06	0.25	0.42	0.674
			Future use					
Traditional	423	2.86	1.31	13	3.15	1.40	-0.78	0.433
Computers	433	3.86	1.25	13	3.92	1.18	-0.17	0.867
Video	427	2.83	1.24	12	2.58	1.24	0.70	0.487
Satellite up/downlink	446	2.31	1.14	12	2.08	0.66	0.69	0.488
Microwave transmission	432	1.62	0.98	11	1.36	0.67	0.86	0.391
Fiber-optics	435	1.77	1.10	11	1.81	0.87	-0.14	0.892
Interactive videodisk	444	1.71	0.98	11	1.72	0.78	-0.04	0.971

[a]Rated on a 5-point Likert scale with 1 as "None (0 times/month)" and 5 as "Nearly always (>15 times/month)."

Table A.4. Differences between responding and non-responding Extension staff when comparing the use of ET in group instruction (Section VI)

Barriers	Respondents N	Respondents Mean[a]	Respondents S.D.	Non-respondents N	Non-respondents Mean[a]	Non-respondents S.D.	t-value	Prob.
Current use								
Traditional	490	3.36	1.21	18	3.05	1.47	1.04	0.299
Computers	490	2.59	1.34	17	2.05	0.88	1.63	0.105
Video	489	2.69	1.15	17	2.41	0.87	0.99	0.322
Satellite up/downlink	469	1.69	0.92	17	1.23	0.43	2.03	0.043
Microwave transmission	448	1.20	0.65	17	1.00	0.00	1.30	0.194
Fiber-optics	445	1.22	0.70	17	1.00	0.00	1.32	0.189
Interactive videodisk	445	1.18	0.62	17	1.00	0.00	1.20	0.229
Future use								
Traditional	433	3.31	1.20	16	3.18	1.27	0.40	0.686
Computers	431	3.04	1.33	16	3.00	1.15	0.14	0.891
Video	432	3.09	1.20	16	3.18	0.98	-0.30	0.761
Satellite up/downlink	451	2.48	1.17	15	2.13	0.99	1.14	0.253
Microwave transmission	425	1.65	1.00	14	1.35	0.74	1.10	0.271
Fiber-optics	430	1.76	1.09	14	1.57	0.85	0.64	0.524
Interactive videodisk	435	1.74	1.01	14	1.57	0.85	0.64	0.524

[a]Rated on a 5-point Likert scale with 1 as "None (0 times/month)" and 5 as "Nearly always (>15 times/month)."

Table A.5. Differences between responding and non-responding Extension staff when comparing the use of ET in individual instruction (Section VI)

Barriers	Respondents N	Respondents Mean[a]	Respondents S.D.	Non-respondents N	Non-respondents Mean[a]	Non-respondents S.D.	t-value	Prob.
Current use								
Traditional	487	2.23	1.31	17	2.23	1.56	-0.02	0.987
Computers	491	2.52	1.26	17	2.23	1.03	0.93	0.351
Video	487	2.18	1.14	17	1.70	0.92	1.71	0.089
Satellite up/downlink	464	1.27	0.27	17	1.11	0.33	1.02	0.308
Microwave transmission	450	1.09	0.38	17	1.00	0.00	1.04	0.301
Fiber-optics	448	1.11	0.56	17	1.00	0.00	1.03	0.303
Interactive videodisk	449	1.07	0.29	17	1.11	0.48	-0.63	0.530
Future use								
Traditional	432	2.25	1.30	14	2.57	1.55	-0.90	0.371
Computers	437	3.01	1.29	15	2.86	1.30	0.44	0.661
Video	432	2.64	1.26	14	2.57	1.34	0.22	0.824
Satellite up/downlink	435	1.67	0.98	15	1.40	0.63	1.09	0.276
Microwave transmission	423	1.44	0.84	14	1.28	0.61	0.70	0.486
Fiber-optics	424	1.55	0.97	14	1.35	0.63	0.77	0.443
Interactive videodisk	432	1.58	0.99	14	1.42	0.75	0.58	0.559

[a]Rated on a 5-point Likert scale with 1 as "None (0 times/month)" and 5 as "Nearly always (>15 times/month)."

APPENDIX B.

SURVEY INSTRUMENT

Iowa State University
134
of Science and Technology

EXTENSION EDUCATIONAL TECHNOLOGY SURVEY

The purpose of this survey is to determine the interest , use, and expected use of educational technologies in the extension service. Educational technologies are those pieces of equipment and supporting software that assist you in your program delivery. Various classes of educational technologies are defined in the survey. We thank you for your participation and would be pleased to provide a summary of the results.

I. DEMOGRAPHIC INFORMATION:

1. Age _____ 2. Sex _____

3. What is your present position? (Check all that apply.)

   1. 4-H & Youth staff member
   2. Home Economics staff member
   3. Agricultural staff member
   4. Administrative staff member
   5. Area or State Specialist

4. What is the major field of study for your B.S. degree?

   1. Agricultural Business/Management
   2. Agricultural Plant/Soil Sciences
   3. Agricultural Animal Sciences
   4. Agricultural Engineering
   5. Home Economics
   6. Math or Physical Sciences
   7. Social Sciences (Soc, Psych, etc...)
   8. Other _____

5. What was the level and major of your last degree?

   Level _____

   Major _____

6. How long have you been employed by extension (in years)?

   _____

7. Approximately how many group presentations would you make per year, and what is the average attendance at those meetings?

   Number _____ Attendance _____

8. Approximately how many individualized (office calls, site visits, counseling, etc...) contacts would you make per year?

   _____

9. How many inservices or parts of an inservice have you attended that focused on the use of educational technologies?

   In the last two years: _____

   In the last 3-5 years: _____

10. How many times per week would you use all forms of educational technologies in your work?

    _____

II. CURRENT INVENTORY: Please identify the <u>number</u> of pieces of equipment available to you.

Audio-cassette player	_____	CD ROM (Compact disk)	_____
Carousel slide project	_____	Satellite downlink	_____
Overhead computer projector	_____	VCR camera	_____
Overhead projector	_____	VCR player/recorder	_____
Movie projector	_____	OTHER:	
Microcomputers	_____	_____	_____
Microcomputer modem	_____		
Interactive video disk	_____	_____	_____

Upon completion of this, survey please mail it to:

Extension Ed/Tech Survey
% Eusebio D. Torres
223 Curtiss Hall, I.S.U.
Ames, IA 50011

ID No: _____

For follow-up purposes only!

(CONTINUE ON THE NEXT PAGE.)

III. EDUCATIONAL TECHNOLOGIES: (Hardware and software used for the enhancement of education.)

For the set of statements below, please circle the number between 1 and 5 which most closely reflects your level of agreement with the question posed. When responding to the items below, please use the following scale:

1	2	3	4	5
STRONGLY DISAGREE	DISAGREE	NEITHER AGREE OR DISAGREE	AGREE	STRONGLY AGREE

EXAMPLE: 1 2 3 4 5 Embracing new technologies on the part of extension agents will be mandatory in developing and promoting future agricultural programs for area farmers.

1 2 3 4 5 I am willing to learn to use new educational technologies.

1 2 3 4 5 I would like to see more educational technologies available for use in extension.

1 2 3 4 5 Educational technologies are more applicable to formal (versus informal) learning situations.

1 2 3 4 5 Administration should provide more accessibility to new educational technologies.

1 2 3 4 5 Currently available educational technologies are sufficient for my needs.

1 2 3 4 5 I do foresee the adoption of new educational technologies by those in extension.

1 2 3 4 5 Educational technologies for use out of the office should be stressed.

1 2 3 4 5 Technical inservices should be emphasized, not the use of new educational technologies.

1 2 3 4 5 Administration should provide adequate time to learn the use of educational technologies.

1 2 3 4 5 Administration should provide adequate resources necessary to adopt new educational technologies.

1 2 3 4 5 Extension staff members should be exposed to educational technologies during their induction training.

1 2 3 4 5 New educational technologies would contribute to a more efficient use of my time.

1 2 3 4 5 New educational technologies should be introduced by experts in those technological fields.

1 2 3 4 5 There is little need for new educational technologies in my work.

1 2 3 4 5 Educational technologies are changing so fast that I feel that when I become proficient with one, it will soon be out-of-date.

1 2 3 4 5 Extension agents should not be burdened with the learning of educational technologies as the introduction to new technical material is more important.

1 2 3 4 5 Attendance at workshops that deal with the introduction of new educational technologies should be required.

1 2 3 4 5 I am satisfied with my current knowledge of educational technologies.

1 2 3 4 5 The use of educational technologies has the potential to help me in my work.

1 2 3 4 5 More attention should be devoted to the use of current educational technologies such as computers, VCRs, etc... rather than emerging technologies such as satellite downlink, fiber optics, networks, etc.

(CONTINUE ON THE NEXT PAGE.)

IV. BARRIERS: Listed below are several possible barriers which may have prevented you from utilizing one or more of the listed classes of educational technologies. Classes of educational technologies and examples are listed below:

TRADITIONAL:	**carousel slide projector, overhead projector, movie projector, audio-cassette player.**
COMPUTERS:	**microcomputer, mini-computer, modem, CD (compact disk) ROM, overhead projection units.**
VIDEO:	**VCR player, VCR camera, VCR recorder/player.**
EMERGING:	**satellite uplink/downlink, microwave tower communication systems, fiber optic transmission land-line, FM side-band, interactive video-disk/computer.**

For each class of educational technology, please rate the importance of each barrier according to the following scale:

1 - This barrier is not limiting in the use of this technology.
2 - This barrier mildly limits the use of this technology.
3 - This barrier moderately limits the use of this technology.
4 - This barrier significantly limits the use of this technology.
5 - This barrier completely blocks the use of this technology.
6 - Do not know.

BARRIERS / TECHNOLOGIES	Lack of Funds	Lack Of Experience	Conflict With Other Job Responsibilities	Lack Of Time	Unaware Of The Technology	No Interest In The Equipment	Lack Of Adminis-trative Support	Lack Of Training
Traditional								
Computer								
Video								
EMERGING: Satellite up/downlink								
Microwave transmissions								
Fiber-optics								
Interactive video-disk								

(CONTINUE ON THE NEXT PAGE.)

V. EDUCATIONAL MATERIALS AND SOFTWARE: Identify the extent to which you CURRENTLY USE and/or ANTICIPATE USING (within the next 2 years) the following types of educational materials in your extension programs. Please use the following scale measured in T/M; Times/Month).

1: NONE (0 T/M) 2: LITTLE (1-5 T/M) 3: FREQUENTLY (6-10 T/M) 4: MUCH (11-15 T/M) 5: NEARLY ALWAYS (>15 T/M)

	CURRENTLY USING	ANTICIPATE USING
Spreadsheets	1 2 3 4 5	1 2 3 4 5
Word Processing	1 2 3 4 5	1 2 3 4 5
Data Base Management	1 2 3 4 5	1 2 3 4 5
Telecommunications	1 2 3 4 5	1 2 3 4 5
Presentation graphics	1 2 3 4 5	1 2 3 4 5
Tutorial Programs	1 2 3 4 5	1 2 3 4 5

	CURRENTLY USING	ANTICIPATE USING
Drill/Practice Programs	1 2 3 4 5	1 2 3 4 5
Simulation Programs	1 2 3 4 5	1 2 3 4 5
Decision Aid Programs	1 2 3 4 5	1 2 3 4 5
Expert Systems	1 2 3 4 5	1 2 3 4 5
Videotapes	1 2 3 4 5	1 2 3 4 5
Info./Data Base Services	1 2 3 4 5	1 2 3 4 5

VI. For subsections A, B, & C, using the same rating scale as above, please indicate how often you CURRENTLY USE and ANTICIPATE USING (within the next two years) the following classes of educational technologies equipment in your extension programs. Classes of educational technologies and examples are listed below:

TRADITIONAL:	carousel slide projector, overhead projector, movie projector, audio-cassette player.
COMPUTERS:	microcomputer, mini-computer, modem, CD (compact disk) ROM, overhead projection units.
VIDEO:	VCR player, VCR camera, VCR recorder/player.
EMERGING:	satellite uplink/downlink, microwave communication, fiber optic land-line, FM side-band, interactive video-disk.

A. ADMINISTRATION & PLANNING: This category deals with activities that are involved with program planning and the administration of your program.

	CURRENTLY USING	ANTICIPATE USING
Traditional	1 2 3 4 5	1 2 3 4 5
Computers	1 2 3 4 5	1 2 3 4 5
Video	1 2 3 4 5	1 2 3 4 5
Emerging:		
Satellite uplink/downlink	1 2 3 4 5	1 2 3 4 5
Microwave transmission	1 2 3 4 5	1 2 3 4 5
Fiber-optics (land-line)	1 2 3 4 5	1 2 3 4 5
Interactive video-disk	1 2 3 4 5	1 2 3 4 5

B. GROUP INSTRUCTION: This category is deals with educational activities that involve groups of two or more individuals such as meetings, seminars, short-courses, etc.

CURRENTLY USING	ANTICIPATE USING
1 2 3 4 5	1 2 3 4 5
1 2 3 4 5	1 2 3 4 5
1 2 3 4 5	1 2 3 4 5
1 2 3 4 5	1 2 3 4 5
1 2 3 4 5	1 2 3 4 5
1 2 3 4 5	1 2 3 4 5
1 2 3 4 5	1 2 3 4 5

C. INDIVIDUAL INSTRUCTION: This category deals with one-on-one education such as office callers, clients, visitors, site visits, clientele counseling, etc.

CURRENTLY USING	ANTICIPATE USING
1 2 3 4 5	1 2 3 4 5
1 2 3 4 5	1 2 3 4 5
1 2 3 4 5	1 2 3 4 5
1 2 3 4 5	1 2 3 4 5
1 2 3 4 5	1 2 3 4 5
1 2 3 4 5	1 2 3 4 5
1 2 3 4 5	1 2 3 4 5